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Telephone Development.

IN our leading article of November 1st, 1929, we commented upon the notable advance made in telephony during the past few years. In the application of technical improvements to the communication services the British Post Office has a fine record, which should, we think, be attributed mainly to the fact that the hour found the man. Probably many of those listening to the presidential address of Sir Thomas Purves to the Institution of Electrical Engineers wondered whether the full value of his work and the work of his staff was being utilised. In other words, are as many people benefited to as great a degree as the efforts of the Post Office engineers have made technically possible?

Statistics relating to foreign countries are not always closely relevant to conditions here, but when there is so extravagant a discrepancy between the number of telephone instruments in use per 1,000 inhabitants as exists between Great Britain and the U.S.A. (a ratio exceeding four to one) a *primâ facie* case for investigation is presented. The chief reason for our shortcomings appears to lie in the commercial methods of the Post Office. Whilst giving that department credit for recent proposals to extend its facilities in rural areas and even for improvements in its attitude towards the securing of new subscribers, we still think its methods are more in keeping with the gloomy dignity of St. Martin's-le-Grand than with the idea of extending an important service to the largest possible number of people. It is of no use multiplying exchanges unless a corresponding amount of energy is expended in securing subscribers to make such schemes, so far as is practicable, economically sound. The point of view of the Post Office still seems to be that the telephone service should be run with the primary object of avoiding bad debts, and that any subscriber likely to use more than his quota of calls is a probable defaulter. The telephone service is, and must be, considered as a huge business capable of rapid extension; this aspect of its duties is, however, dealt with in a manner that in a large privately-owned business could only result in disaster.

It is surely unsatisfactory that the rate of growth of revenue should be, at the present unsaturated stage of development, only 7½ per cent. per annum. Those who have become accustomed to the use of the telephone in their own homes would rather dispense with many another item of utility than be deprived of the con-

venience, and the saving of time and labour, and often of money also, which it brings; those who are without this experience cannot be expected to realise its full import. In spite of the cynics, the primary duty of salesmanship is to save the customer the necessity of discovering by experience the merits of an article—an experience, moreover, which it might not have seemed to him worth acquiring on his own initiative. A large field awaits development among people who at present regard the telephone as a luxury a little—but only a little—beyond their means.

It is in this neglect of the elements of salesmanship that the Post Office stands between its engineers and the public, and hinders the full exploitation of recent technical achievements.

Apropos of the foregoing, the address delivered last week by Sir Alexander Roger, as president of the Telephone Development Association, and noted in this issue, is a pronouncement of considerable interest. The Association has as its principal objects the increase of the number of subscribers and the volume of communication traffic.

The Telephone Development Association owes its finances to manufacturing interests, but that detracts not at all from the weight of its president's indictment. We may apply to the Association's work the reflection contained in our leading article of September 13th last, on the beginnings of the telephone system of Great Britain, which we referred to as originally undertaken by men in quest of gain whose enterprise conferred more advantage on the world than it yielded material profit to themselves.

Sir Alexander rightly confines his criticism to the system, and mentions particularly the noxious procedure of handing over any working surplus to the Treasury, the equivalent of allocation in relief of rates in municipal electricity supply.

The Association is not in favour of unrestricted private enterprise in telephony, but evidently favours administration of the service by a public statutory authority on the lines of the Central Electricity Board. We, ourselves, think that at the least a case has been made out for public inquiry.

The Use of Technical Journals.

It has long been a commonplace that no electrical engineer, or trader, is adequately equipped for mainaining his efficiency unless he has his own personal copy of a technical journal. He should read it regularly, or he cannot keep himself up-to-date. But there are many companies and firms which, for the purpose of ensuring that their business shall collect the cream of all that appears in such publications, facilitate the studies of their officials by circulating copies through the different departments. As we have frequently stated, however, our companies, with few exceptions, do not do this on a sufficiently large scale to make the journey of the journal an expeditious one.

Any of our readers who has held a position with a large firm or undertaking will sympathise with the complaint of a contributor this week that efficient use is not always made of technical journals. We all know the procedure under which the various papers, each pasted with a slip setting out the names of the staff, pursue their leisurely course round the offices. We know, too, how little time there is in our working hours for reading even those articles that bear most nearly on our particular work. Furthermore, those whose names come near the end are influenced also by the psychological consideration that an article, even if not topical and of a purely technical character, seems stale in a paper of more than a week old.

A most effective method of ensuring that the staff gets the best out of the Press is one adopted by several firms that pay the annual subscriptions for selected papers, which are sent to the private addresses of staff members. Such a course may add materially to the allocation for technical journals, but it is an expense that is clearly justified if the efficiency of the staff is thereby improved. Taking the more widely-read weekly papers dealing with the supply of electricity from one aspect or another, the most expensive make only a trifling addition to the cost of the services of a man whose year's salary may amount to several hundreds of pounds. It is surely not too much to expect that his worth to the industry will be increased by at least the amount of the annual subscription. This is quite apart from the consideration of overtime paid for at so low a rate and worked at the reader's own inclination when his mind is fresh. This will almost always be the case, since what the post brings will be opened and read at leisure in a spirit very different to that possible in the rush of daily duties. Systematic overtime is not to be encouraged, but we do not think the study of technical literature should be so regarded, since it is clearly to a man's own advantage to follow closely the technical Press, not only for its more obvious effect in promoting practical utility, but also for the cultural training it provides in relating an engineer to his profession as a whole, and that profession to the world at large.

After-Dinner Oratory.

Rationalisation was defined by Mr. V. Watlington at the Electrical Wholesalers' dinner as an attempt to balance production and demand, but no attempt of this nature was made with regard to the oratory which followed that dinner.

At the risk of being accused of "sinning against the salt" we are compelled to protest against 2¼ hours of speeches, even if the time *is* apportioned among ten speakers (one speaking twice).

These annual gatherings afford infrequent opportunities to members of the associations concerned to meet and discuss their affairs and generally to be sociable, but the opportunity is gravely restricted if they are kept listening to speeches until a late hour.

We appeal to the organisers of electrical dinners to arrange for fewer speakers and shorter speeches and feel certain that in doing so we have the support of all who attend these functions.

The British Industries Fair.

After passing through many vicissitudes and threats of extinction, the British Industries Fair appears to have come into its own. To-day it is a vital factor in this country's economic life and a most potent stimulus to export trade.

The Fair is a happy example of Government and private co-operation; in London the Department of Overseas Trade and in Birmingham the Chamber of Commerce have forged ahead in the face of indifference, and sometimes actual hostility, and have brought this annual event into a position of prominence and great value.

It also represents the co-operation of hundreds of far-seeing business men, many of whom have faithfully supported the Fair since its commencement. They must have reaped their reward, and at the same time have helped the industries of the country as a whole.

Still, as the Duke of York pointed out at the Mansion House banquet on Monday, there is scope for even further expansion. Many industries still remain unrepresented, and several leading concerns in industries which already participate are absent. We are convinced, however, that the growing success of the display will have its effect on these, and impel them to add to its strength.

That the present Fair will be successful there seems little doubt. Never before in its history has it received so much attention, and year by year the methods of attracting overseas buyers have been improved, so that a large concourse from abroad should be assured. The home buyer, too, has had the value of a visit impressed upon him, and he will be wise to seize this opportunity of inspecting different makers' goods in his own particular line arranged side by side.

A valuable feature of the Fair is its purely business nature. Visitors can conduct their transactions and discuss matters with trade representatives unhampered by the "crush" which is the main drawback to public exhibitions.

Real Rural Development.

Being an account of the remarkable achievements of the Shropshire, Worcestershire, and Staffordshire Electric Power Company in sparsely-populated portions of its area.

(*Concluded from page* 291.)

The ordinary farmer also is becoming increasingly aware of the economic as well as the comfort-bringing qualities of electricity, and of the fact that his wife's time has a monetary value; she is freed from attending to oil lamps and coal fires. A typical old farmhouse kitchen, complete with an electric cooker, is illustrated in fig. 7, while fig. 10 shows two other duties which electricity fulfils to the farmer's entire satisfaction. Intermittent heating by electric fires is also proving exceedingly popular.

The vigorous manner in which the company has tackled the problem of domestic electrification in its out-

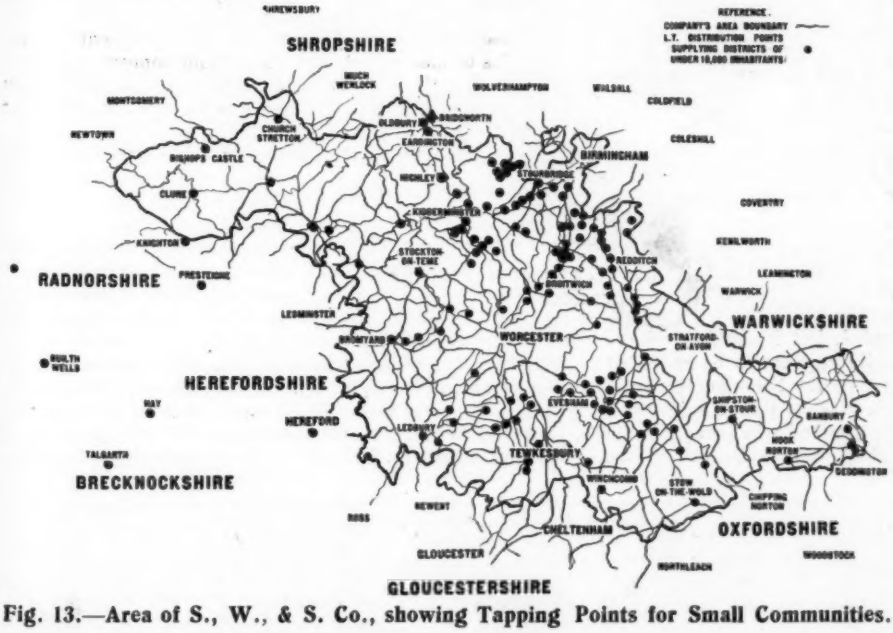


Fig. 13.—Area of S., W., & S. Co., showing Tapping Points for Small Communities.

lying districts is well exemplified by developments at Catshill, which is a hamlet near Bromsgrove, consisting of little villas and cottages occupied by small-holders. These dwellings are somewhat scattered and overhead distribution provides the only commercially possible method of supply. Practically all the inhabitants are consumers. Little cooking is done during the week, and peak diversity of this load on the main substation is therefore extraordinary, as the load for the hamlet is on Sunday mornings some three times the maximum of other days. This feature, while being highly satisfactory from the aspect of generation, presents problems in the economic operation of the local low-voltage system.

A careful census of a village in Worcestershire was made to obtain the characteristics of a village load. The population of the village was 1,040, and the number of consumers 202. The latter consisted of 6 shops, 187 private houses, 2 business houses, 1 church, 5 inns, and a picture house giving two evening shows per week. The total connections amounted to 395 kW, made up as follows: lighting, 64.3 kW; power, 2.5 kW; heating, 14.8 kW; cooking, 313.4 kW. The connected load per head of population is 379 watts. To serve this village, transformer capacity of 100 kVA is available, and the maximum demand (instantaneous value) is 72 kW. The kWh sold in 1927, the year of the census, were as follows: March quarter 16,514, June quarter 12,167, September quarter 15,193, December quarter 17,280, making a total for the year of 61,154. In 1928 the consumers had increased from 202 to 216, but the units sold had increased from 61,154 to 71,099.

Housing schemes, as one might expect, provide an increasingly important load for the company. As a contrast between the old and new ideas on the subject we may take the case of Pershore. The old town, although containing over 4,000 inhabitants, is without either public water or sewage services. The new housing scheme, however, enjoys both, as automatic unattended electric pumping stations do all that is necessary in both cases. Moreover, the 36 cottages have the benefit of electric lighting and cooking. "Maconite" cabling is run in cleats under the eaves and two phases and the neutral are run into each dwelling, the whole scheme having a remarkably neat appearance.

There are, as shown in fig. 13, some 150 points at which the high-voltage system is tapped for giving low-voltage supplies to communities of less than 10,000 people, 75 per cent. being villages of not more than 1,000 inhabitants.

The company is showing very commendable initiative in developing new outlets for electricity. Thus, it is carrying out an experiment in the electrical drying of hops. Commercial results have not yet been obtained, but, as 40 per cent. of the hops grown in this country comes from the company's area, efforts in this direction are likely to prove well worth while. The experimental hop-drying plant is illustrated in fig. 5. The company has also purchased a rotary tiller, but data relative to its performance are not yet available. Tests of soil heating by the company have definitely established that the application of current in March to resistance elements buried 9 in. below the surface and 2 ft. apart (fig. 4) caused radishes, lettuces, peas, and beans to be advanced quite a fortnight in growth—an important consideration in the face of foreign competition in the provision of early vegetables.

Another field in which the company expects to find considerable scope is the heating of water for domestic supplies at a quarterly all-in rental. Energy will be

used off-peak only and the price, it is realised, will have to be very low. Such a service as this will undoubtedly confer one of the greatest possible boons on the countryside.

Mention must also be made of arrangements between the company and a prominent farmer for a term of years. Experiments are being carried out on this farm in the applications of electricity to agriculture, and facilities are available for obtaining the full comparative costs of electrical, as compared with other methods. The working expenses, together with the knowledge so gained, are placed at the disposal of farmers generally.

The Provision of Service.

One obtains a distinct impression that the undertaking is organised and operated with the prime object of giving service to the community, the production of electricity in its technical and economic bearings being subordinated to that end. That this policy is a profitable one to the company merely proves the occasional truth of the doctrine propounded by the old economists as to the beneficial results to all parties of "enlightened selfishness." In any case, there is enough evidence to show that good service in electricity supply is commercially sound.

It is unnecessary to say that good relations with consumers are sedulously cultivated, but it should perhaps be added that the entire public appears to be regarded as made up of potential consumers. No opportunity is lost of setting a good example of local public spirit and of influencing the mind of the passer-by in favour of the undertaking. Thus, the exteriors of sub-stations are kept tidy, and no effort is spared to keep overhead lines inconspicuous. Stourport power station is thrown open for inspection to all and sundry on Wednesday and Thursday afternoons, and numerous visitors take advantage of the weekly half-holiday to see how the electricity they use, or want to use, is produced. Friendly relations are cultivated with the local Press of every town (which finds the work of the company provides interesting news items), and use is made of the advertisement columns for electrical propaganda.

Local development is carried out by four departments acting in close co-operation. The publicity department, as the forerunner, may be mentioned first. Among its duties are the attraction of consumers to the neighbourhood by securing for them cheap land with good railway, canal, or river communications. It is also responsible for the preparation of propaganda literature, which tells how electricity is to be obtained and what it will do. This information is couched in simple terms, avoiding technicalities, or rather translating them into their pecuniary equivalents. An assortment of attractive brochures used is illustrated in fig. 14.

One of Life's Pleasures
The "ALL'S WELL."
The HOUSE WITH A CHEERY WELCOME
Let us Electrify Your Home
AUTUMN TINTS
& WINTER IS HERE

Fig. 14.—Selection of Attractive Propaganda Literature.

Probably the most conspicuous of the activities of the department consists in the organisation of exhibitions. They are set up in all parts of the area, and each runs for a period of not less than three days. A hall is hired in a town, or sometimes, in the summer, a large tent is erected in the country (see fig. 1). A mobile staff of seven erects, runs, and dismantles the show. Last year 35 such exhibitions were held. In addition to the display of electrical apparatus, demonstrations are given of cooking, ironing, clothes washing, &c., which never fail to attract an interested crowd. Although many direct purchases are made at the stalls, and inquiries are received that lead to business, the exhibitions are not regarded as trading measures, but rather as opportunities for missionary work. Demonstrations are also given in villages immediately prior to the inauguration of electricity supply. In these cases a 15-kW oil-engine set is taken out on one of the four demonstration vans, and cooking by electricity is naturally one of the features of the show. A large meter calibrated in pence enables visitors to watch

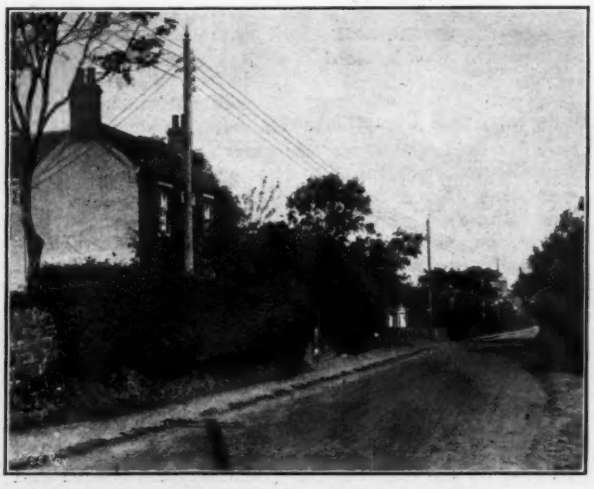


Fig. 15.—A Village Low-voltage Distributor.

Fig. 16.—Service to an Old-world Cottage.

the cost of cooking a meal in the various stages. Besides the company's exhibits, several manufacturers show their specialities. At the exhibition attended by us at Dudley these included the Revo Electric Co., Ltd., Singer Sewing Machine Co., Ltd., and W. & T. Avery, Ltd., as well as local contractors, who seem proud to display notices to the effect that they are members of the

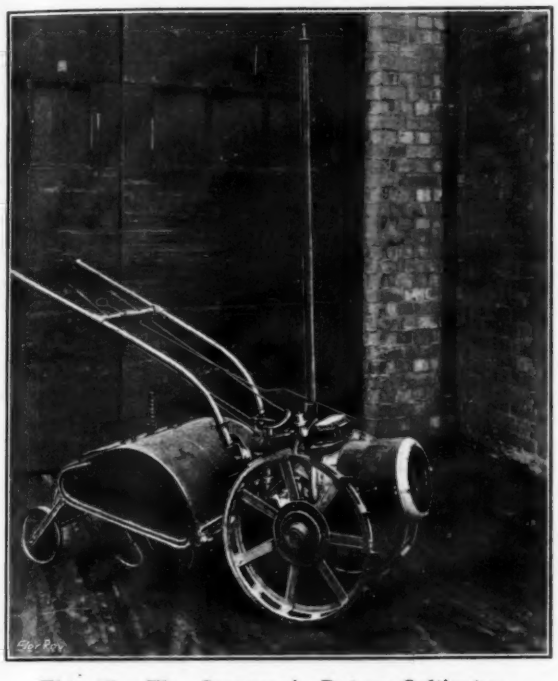


Fig. 17.—The Company's Rotary Cultivator.

S.W. and S. (E.D.A.) circle—of which more anon. Steady counter business is the province of the sales department, which is responsible for the permanent showrooms situated in important thoroughfares in 14 towns. The windows are strikingly, but simply, dressed in a uniform style which is changed at frequent intervals. Arrangements are in force for the payment of accounts for electricity at any showroom, and contractors recommending the purchase of apparatus therein are allowed the usual discount. Care as to what is seemly in relation to local conditions is indicated in fig. 8, which illustrates the charming half-timbered cottage that has been chosen for the showroom in the old-world town of Ludlow. As the upper storey is occupied by an antique dealer, a comparison between the best of ancient and modern fittings may be made. As a contrast of types, fig. 3 is a view of the plain, but dignified, showroom premises occupying a corner site in a manufacturing town.

The construction of tariffs is in the province of the chief commercial officer, who also conducts negotiations for larger power supplies. The latter are for short terms, unless the consumer desires otherwise, and the contracts contain coal and wages adjustment clauses.

The important duty of providing a nexus with the consumer is entrusted to 14 district representatives, who are responsible directly to the management. Their work is about two-thirds commercial, *i.e.*, attending to the interests of consumers, the remainder consisting largely in the laying and maintenance of services and the maintenance of low-voltage distributors. The staff under each district representative consists of about 20 men and women, and includes assistant engineers, a lady demonstrator, jointers and mates, meter readers, clerks, canvassers, and domestic appliance fixers. The last-named fulfil a useful function in that they are trained to be able to help the consumer in various ways electrically, and to answer sensibly questions that may not be so sensible. The organisation provides for prompt attention at any time to those troubles, such as blown fuses, which must be considered as part of the price of the comfort and convenience of electricity. Indirectly connected with consumers' work are the research and meter departments. The former carries out extensive experimental work with a view to the initiation of new uses of electricity, and its scope is such that only a large undertaking could afford its upkeep. Such applications as rotary tilling, hop drying, and soil heating, previously outlined, serve to mark its importance in developing the load. The meter department operates in a test-room capable of dealing with 20,000 meters per annum, and is in course of enlargement. There are now 32,000 meters out on the system, including 4,500 of the prepayment type. The maximum period between tests is four years, and each meter is fitted with a tab, the colour of which denotes the year of installation; in this way meters that should be returned to the department may be easily recognised by the meter-readers. In addition to the supervision of meters, the department is responsible for the maintenance of hired installations and the reconditioning of apparatus.

For assisting all classes of people to enjoy the benefits of electricity, the company offers to accept payment for wiring (except for cookers) by 12 equal quarterly instalments of 2s. per point for lighting, or from 2s. 10½d. to 3s. 4d. per point for heating, depending upon the number of points. Even these favourable terms are beyond the reach of many potential consumers, and they, after paying one-twelfth of the cost of the installation, pay for the balance through pre-payment meters at the extra rate per kWh of 2d. for lighting and 0.25d. for heating. It should be noted that the extra rate is charged only until the cost of the installation has been paid off. The reason that cookers are excepted from these terms is that no charge at all is made for their wiring.

Apparatus, except irons and kettles, may be hired at the following rentals: cookers (minimum, one year), from 5s. to 10s. per quarter, according to the size required; fires, 5s. per annum, and 2s. 6d. and 3s. per quarter (minimum one quarter); and wash boilers, 4s. per

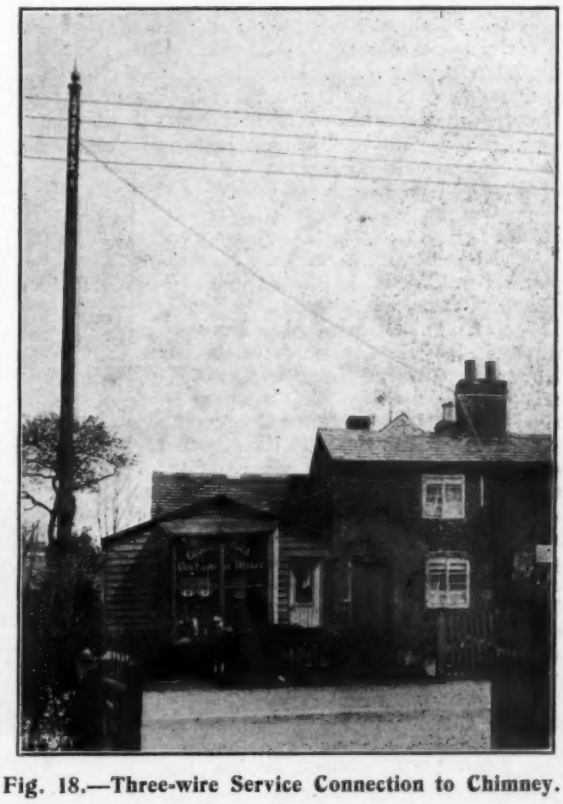


Fig. 18.—Three-wire Service Connection to Chimney.

quarter. The company is not prepared to hire out kettles, owing to the likelihood of their being abused. Consumers in rural districts have become accustomed to kitchen utensils that can be placed on coal fires and oil stoves, and cases have come to the company's notice in

which electric kettles have been treated in the same way. Where a.c. supplies are available, which is generally the case, the " Revo " cooker has been standardised on the ground that the super-speed boiling ring is more suited to the habits of the people. " Revo " cookers are also hired out in d.c. districts, but there, of course, the boiling plates are of the closed type. Every cooker sent out by the company is followed by a postcard suggesting a time for a lady demonstrator (of which the company employs 14) to call and cook the dinner at a certain cost. The meter is read before and after the demonstration; thus instruction is given in how to make the best of the cooker, definite evidence is provided of the cost of electric cooking, and a " bogey " is set up for emulation. The domestic tariff in force in rural parts is for each living room (including bedrooms) 2s. 6d. per summer quarter and 3s. 6d. per winter quarter, plus a running charge of 1.25d. per kWh (as compared with 1.0d. in the larger towns). A cash discount of 2½ per cent. is allowed. This rate is easily competitive, since gas in some cases costs as much as 6s. per 1,000 cu. ft., and in others is non-existent. Cooking by oil is the greatest rival of electricity on farms.

Fig. 19.—A Feature at Agricultural Shows.

An ingenious method has been devised of securing an adequate return on the cost of tapping a high-voltage line for a single farm. The cost of such a tap is about £100, and the farmer is asked to pay an annual rental of £50 which, he can be made to appreciate, is well worth his while to do For this rental, however, he may consume 2,000 kWh without further charge. He takes care to utilise this privilege to the full, and is so pleased with the result of electrification that he does not object to paying 1.5d. per kWh charged for energy in excess of the 2,000 kWh, metered on the low-voltage side of the transformer.

Another point of interest in connection with farm supplies is that of the party line. A farmer who had paid for his connection would often permit a neighbour to take a supply from his service, but if, as sometimes happened, their relations later became strained, the original consumer would put himself into a stronger negotiating position by cutting off the supply of electricity to the other. The company has got over this difficulty by entering into an agreement with every farmer who pays the cost of connection to refund the amount so paid, less depreciation, as soon as the line is used for other supplies. This agreement provides also for a wayleave at standard terms over the farmer's property for a line to any other consumers. Incidentally, the farmer becomes an active canvasser.

The S.W. & S. (E.D.A.) Area Circle of Electrical Installation Contractors.

The contractors' circle plays a prominent part in electrical development in the counties served. Upwards of 70 contractors are registered members and are co-operators with the company. Monthly meetings of the circle are held at which such matters as the allocation of work in various districts are considered, and any differences of opinion are settled. Representatives of the power company also take part in the proceedings and, as all material has to be of British make, so do the manufacturers of wiring and fittings.

The chief value to the company of this organisation is found when opening-up a new district. The contractors in the district concerned automatically receive copies of the statutory monthly notices of the mains extension served by the company on the Postmaster-General and the local authority, and promptly canvass the premises on the route. They have full authority to offer the company's deferred-payment and hire terms and, if successful, carry out the work at the company's schedule rate. The fact that wiring for cookers is free is an additional inducement which a contractor can hold out to a prospective consumer to enlarge the scope of his original application. The circle has proved of advantage to all concerned, and has been influential in securing a sound standard of material and workmanship.

General Organisation of the Undertaking.

As a company enlarges its sphere of action, it is inevitable that the " bottle-neck " of the higher command should tend to retard intensive development unless the organisation be adjusted to obviate this flaw in the practice of large-scale operation. The Shropshire Company has introduced the necessary flexibility through an elaborate devolution of authority which calls for as much initiative from its staff as is compatible with the prosecution of a common policy. Only when more than one department is concerned does the management, represented by the chief of the staff, exercise a co-ordinating function, if circumstances require such intervention. A

Fig. 20.—A 1,300-ft. Span on 11-kV Double-circuit Line.

full-time officer is responsible for labour conditions, and it may be noted that even casual labourers are engaged by means of a form setting out clearly the terms of employment.

The general control of the 1,200 employés of the company is from the handsome offices at Mucklows Hill, near Halesowen, a converted mansion some 600 ft. above sea-level and surrounded by well-kept gardens requiring the care of a gardener and two assistants, who also attend to the ground in front of the sub-stations. In the grounds at the chief office are the garage, with accommodation for 50 cars (mostly Morris) and a canteen where 70 to 80 luncheons—cooked electrically—are provided each day for the staff. It has been found that removal to these healthily-situated offices has had a beneficial effect on the staff.

There are three funds for the benefit of the workmen. The endowment fund has as its object provision for old age. The account of each member is credited with from 1s. to 3s. per week by the company, depending upon his (or her) length of service; if the member also contributes a minimum of 1s. per week, the company pays interest on the whole amount compounded. Thus, if a man contributed 1s. per week for 20 years from the age of 21 years, his credit at the end of the period would total £780, but no payment out is made until he retires due to age or leaves the service of the undertaking. In the event of death payment is made to the next of kin.

The provident fund (which stands at over £10,000) is made up of voluntary deposits by employés of any amount, and sums invested may be withdrawn at short notice. There is also a benevolent fund, financially supported by the company, to which any workman may contribute 2d. per week; this fund, which is administered by the men themselves, provides special medical or dental treatment for members and their dependants and also, when necessary, allows for a stay at a convalescent home.

The salaried staff has a fund of its own. Six per cent. of all salaries is deducted at the source and the same amount contributed by the company, the whole being invested in trustee stock and credited at compound interest. Any depreciation in value of securities is made good by the company, but appreciation stands to the benefit of the staff member after deduction of sums previously allowed for depreciation. In the event of death a widow's pension of £52 per annum for life is allowed from a special fund known as the City Widows' Pension Fund.

In closing this necessarily brief account of the work of a large power company as we saw it, we would draw attention to the considered view of the company regarding development in rural areas. This view, which is strongly held, is that the initiative, intensive propaganda, hire of apparatus, suitable tariffs, and prompt service to which we have referred give an absolute minimum of conditions to be observed, if supplies in sparsely populated districts are to be made economically possible.

Our thanks are due to Mr. J. T. H. Legge, managing director of the Shropshire, Worcestershire and Staffordshire Electric Power Company, of which Mr. E. Garcke is chairman, for information readily placed at our disposal and for permission to reproduce the photographs illustrating this article. Our thanks are also due to several members of his staff for their help in obtaining the particulars upon which this article is based.

The Book Club.

The author offers criticisms regarding present methods of circulating technical journals in works and offices, and makes suggestions for securing improvement.

By RIC.

THERE are innumerable weekly and monthly engineering papers published in England. Nobody has the time, and few have the inclination, to read all those that deal even with his own branch of the profession.

Technical papers on one subject differ even more widely than daily papers with opposite political views. In the technical world there is no "man-in-the-street," no general public. The reader stands on the hub of a wheel, there is a man with a point of view at the end of every spoke, and it is worth the reader's while to get outside himself once a week; to see himself and his job from as many of those points of view as possible, not merely one. He spends all his life seeing other people—as they appear to be to him.

Every employer of standing realises the importance of keeping his men up-to-date. He does not want smatterers who can—and unfortunately will—reel off unimportant trifles by the yard, but men who are keenly alive to what is happening around them in the technical world, and alert to the possibilities that exist, but can only be seen by those who have developed the art of standing aside, for a few minutes, to watch the game. Unfortunately the chief's intentions are often far more praiseworthy than the manner in which he attempts to carry them out, the usual practice being to buy a certain number of papers each week—rarely more than one copy of each—and leave them to filter through the departments as best they can. The juniors are fortunate if they manage to glance at them at the end of the week, but it is little use applying for the job that every junior engineer always hopes may turn up a week after it is advertised. Employers may object to their men using their firm's time in which to discover the quickest and most satisfactory way of leaving them; some have taken drastic steps to prevent it. The practice of "editing" has been the subject of more than one batch of correspondence in the REVIEW. Editing, in this sense, means cutting out the "Positions Vacant" columns before the papers are passed to the staff. It is a senseless practice that defeats its own object almost every time. A good man who wants to go will do so, if if is humanly possible, and will not wait for jobs to come to him; a good man, properly treated, will not be in such a hurry to go.

Lack of interest in the service actually given by the literature provided, and in many cases "editing," has produced the staff-run book club. There are two forms: the "one man, one book" arrangement, and the very common subscription club. As they are usually run, neither is efficient, but the last could be.

One day Brown shows his own pet journal to a colleague. It happens to be one that is not provided by the firm, and the colleague notices that it contains more pictures or signed articles—or less of either—than his own favourite, and they decide to exchange. Soon they rope in the rest of their crowd, and the club exists. In future, Brown's "rag" is delivered at the office instead of at home, and everyone can enjoy looking at the cover.

But he guards it jealously all day and takes it home with him, ostensibly to read. Actually, it remains under his gloves on the hall-stand until after the week-end. He brings it back on Monday morning, unless he forgets, and slings it on the table: "Here's my rag, if anybody wants to see it—nothing in it." Then he picks up two or three other journals left there in exactly the same manner by other people, skips through them in five minutes, and complains that there is nothing worth reading in the lot—they are stale anyway. In a short time the efficiency of such a book club, with ten members, is ten per cent.; each man might just as well have his copy delivered at home and leave it there.

The subscription club is run by the most weak-willed member of the staff. The greater the number of members, the more journals or the less the subscription—usually the latter. The "club secretary" sees to it that books arrive each week and month, and he takes care that he is no more out of pocket at the end of the year than he should reasonably expect to be. The distribution of the papers, the extent to which they are read, and their ultimate end does not concern him.

A journal published on Wednesday goes into the sales department on Thursday; "estimates" get it the following morning and pass it to the D.O. on Friday afternoon, just before it is time to go home. The D.O., having a large staff, keeps it until the following Tuesday, and "service" receives it, a week old, on the day the new copy is published. Nobody has had time for more than a glance at this and the other half-dozen papers on the list. This assumes that the journals take a steady journey through the works; their travels are made longer and more erratic by people who stroll in casually from next-door for a chat, and, casually and so innocently, stroll out again. . . . Piracy is infectious. After a while the journals are known to arrive, and actually can be seen on the table in the General Office. They leave that table, and half-way through the week Brown wants to know where the "rag" is. It turns out that everyone else is wondering exactly the same thing, but nobody has seen it. Neither does Brown see it until he finds it, by accident, in a corner of the store cupboard.

The efficient system must control the papers from start to finish and keep them moving. It must enable everyone to see every one that concerns his particular job on the day it is published; it must allow everyone who so wishes to read articles of special interest in reasonable time and before the next number is issued, and it must not restrict any department to its one set of papers. No club can carry out this programme unless its membership is restricted. In a large firm several clubs will be run, each department ordering the journals that particularly concern it, and exchanging with other clubs during the latter part of the week. Choosing the journals is the most difficult part of the work. There are so many, dealing with only one section of a subject. We like some for no other reason than that we feel at home with them; although they are technical, sometimes too formal, we feel the personal touch to some extent.

Departments should co-operate in this matter to avoid duplication and starving themselves of those that are more popular; a few weeks' experiment will show what additional copies are necessary. One man can be responsible for all the papers as they come in, and farm them out according to an agreed plan. An office-boy can deal with them as they come to the particular department. Provide him with a stock of labels divided into three columns and headed: Name, Pages, Time, and let him paste one inside the cover of each paper. The paper is then passed round that department as quickly as possible. Each man glances through it rapidly, jots down the details of any likely-looking advertisement, and marks against his name on the "Request List" the pages he wants to see again. He does this only if the article, or whatever it is, really is important to him and he wants to read it properly as soon as he can. A dozen men will get through these preliminaries in a morning; the boy has the book back by lunch-time and spends a quarter of an hour on the list before letting it out again. The number of requests will vary from week to week; they may all be for different parts of the paper, and everybody may want the same pages. In the first case, it may be possible to split the paper, thereby saving time. Never be afraid to do this; weeklies and monthlies are not intended for the bookshelf as published, and a journal worth binding is worth duplicating. In the second case, he has merely to divide fifteen by the number of names on the list and give the whole copy to the first man. Having finished with it—whether his time is up or not—he passes it on.

Three and a half days from the morning of publication every paper is returned to the "club secretary," and he starts them travelling through the departments in the old way, but each department will be allowed a definite time to see them, and they will not go to those that have had them already. In this way the utmost use is made of each periodical before it becomes out-of-date. At the end of each "publication week" one copy of each is sent to the works' library.

A works' library of technical periodicals—distinct from text-books—is necessary. It is just a spare room—even a corner of the canteen—with a table and a few chairs. Do not spoil it by trying to keep it up-to-date.

Current issues are for circulation; the library is for week-old copies; for reference, or for leisurely reading of matter that can wait. Running the library is a few minutes' work a day for a boy. He merely tears out the request list from the newer book and stores the older one. Popular books that are duplicated or triplicated can, in addition, be stored for quick reference. Six files are sufficient. Label them: News, Plant, Educational, Correspondence, Book Reviews, and Editorial. Their application is obvious.

The co-operation of every member of the club is more important than the cost; the man who is responsible for getting the books must not be left to do all the work. Even if he is willing, his chief will not like it, and it is unnecessary. Suggestions and criticisms will help him, complaints without suggestions will only hinder, and turn a job which, after all, can be very interesting into an insufferable nuisance.

The Production of Electricity in the United States.

An increase of 9.2 per cent. in electricity produced for public use in the United States during 1929 over the 1928 production is estimated by the National Electric Light Association, and the total, 97,000,000,000 units, is reported to be 17.5 per cent. in excess of the 1927 production. During the year 850,000 new customers were added, bringing the total of consumers now served up to 24,050,000, of whom nearly 20,000,000 are domestic users. While factory consumption is said to have increased by 10 per cent., an increase of 16 per cent. in domestic consumption is reported. The Association states that approximately 68 per cent. of the population of the United States is now living in electrically-wired homes, and that in the past seven years 9,600,000 homes have received electric service for the first time. The population living in electrically-wired homes is stated to have increased 520 per cent. in the period between 1912 and 1927, although the population increased by only 24 per cent. in that time. A quarter of a million farms are stated to have been connected for electric service during the past three years, making a total of more than 500,000 farms now electrified. The Association reports that three-quarters of all the power in industry is now electrical, and that the average factory wage-earner has to-day nearly five horse-power at his command, or more than twice that of 1900. It is claimed that electric power costs to the public, including industrial, commercial, and domestic uses, have remained at pre-war levels. The average price for domestic electricity throughout the country is stated to be 28 per cent. below the pre-war level, a drop of 3 per cent. having taken place during 1929.

Heavy Engineering Practice.

An Account of Some of the Principal Products of the English Electric Co., Ltd.

SPECIALISATION in engineering is becoming increasingly necessary in the interests of progress, since it is only in this way that individual energy can be concentrated where it can most effectively be utilised. This tendency is, however, accompanied by a danger of a narrowing of vision and a loss of faculty for relating one's work to that of one's fellows. For this reason, as well as for the human one of gratifying legitimate curiosity in subjects in which one's interests are engaged, it is well to look around occasionally and to take stock of what is being done elsewhere in the world of engineering. A good way of making such a survey is, we believe, to examine the varied products of a leading manufacturing firm, thus obtaining a cross-sectional view, as it were, of industrial progress.

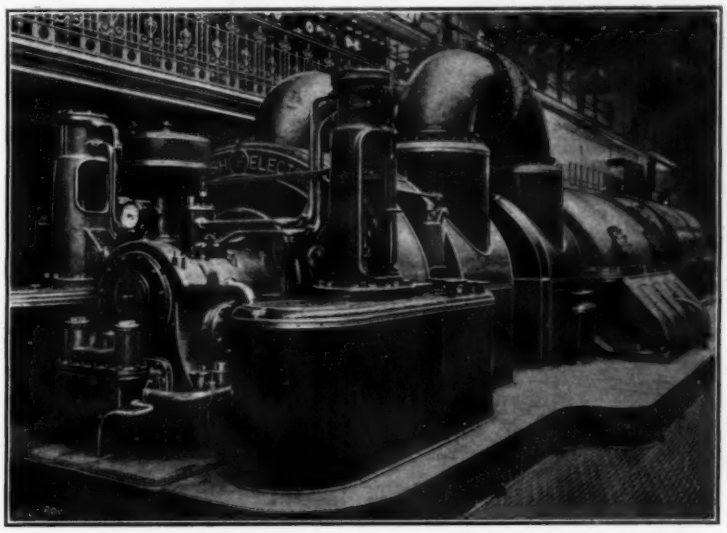


Fig. 1.—The 30,000-kW, 3,000-r.p.m., Set at West Ham.

Such a firm is the English Electric Co., Ltd., which bears an honourable name for technical achievements in the past as well as in the present. Though the implication contained in its name is one of which the English Electric Co. is not unnaturally proud, older engineers still have an affection based on profound esteem for the firms of Willans & Robinson, Dick Kerr and Co., the Phœnix Dynamo Manufacturing Co., and others which merged their separate identities in the present company just over ten years ago. Even if engineering construction in this era of precision machine tools does not call for the same degree of skill in fitters and turners, the tradition of sound and careful workmanship that characterised the work of the earlier companies, as well as the same sound ideas regarding design, are a goodly heritage for the composite firm, a firm that is virile enough not to rest on the laurels earned by its forebears, to which it has, indeed, apparently added.

At Rugby, instead of Willans engines, impulse-reaction steam turbines of many times the capacity are now built. This department is very active at the present time, and has taken the lead in building the largest turbines at the highest possible speeds, with consequent economy in first cost and in operation. The 30,000-kW set (fig. 1) now running at West Ham is said to be the largest yet constructed for a speed of 3,000 r.p.m. (the highest possible for 50-cycle operation), just as the

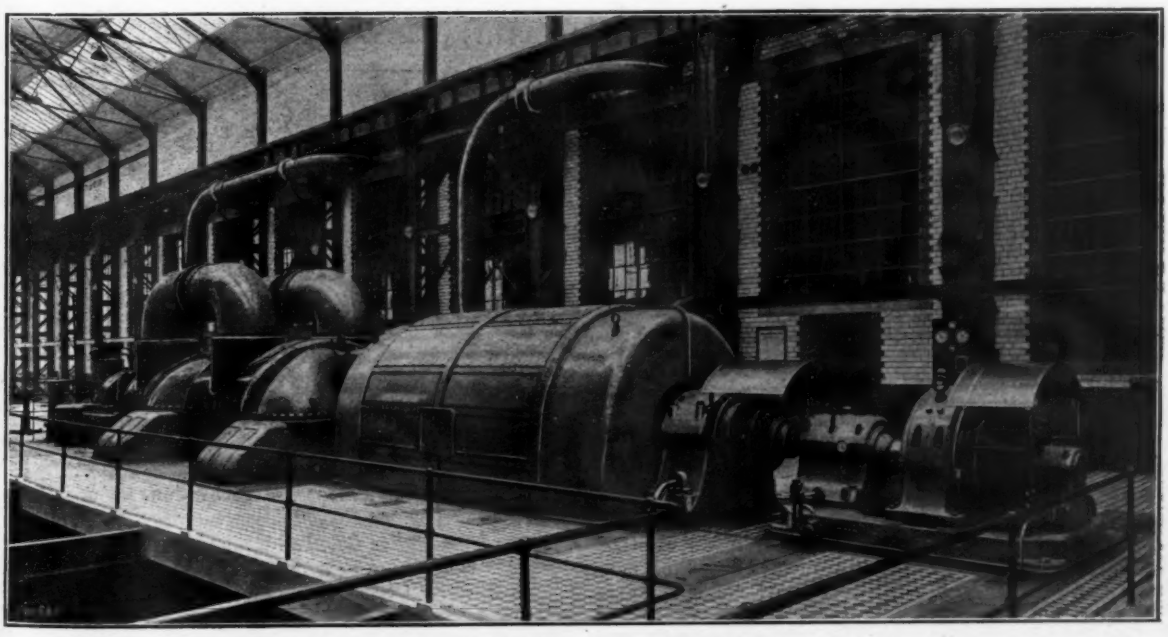


Fig. 2.—The New 25,000-kW Turbo-Alternator at Leicester.

20,000-kW set installed at Bradford in 1925 was at that time the largest to run at this speed. The West Ham turbine is of the three-cylinder compound type with two l.p. cylinders. A sister set is in course of manufacture for the Bradford Corporation, as well as the 2,500-kW back-pressure set designed for a steam pressure of 1,100 lb. per sq. in.; the latter will exhaust into the existing steam range at a pressure of 350 lb. per sq. in. Another 30,000-kW set is under construction for the Sheffield Corporation, but the design has been modified to suit the higher steam pressure (575 lb. per sq. in.) and the three cylinders in tandem will allow for three expansions. Another instance of recent large high-speed sets is that of the 25,000-kW compound tandem set (fig. 2) which was officially started this week at Leicester, although it has been carrying load successfully for some weeks.

Fig. 3.—Two-cylinder Turbine at Stockport; 12,500 kW.

The English Electric Company in many ways helps to pay for this country's imports by the export of electrical apparatus, in which steam turbines play an important part. As examples, we may cite Athens, where three 15,000-kW sets (fig. 4) are installed at St. George's Bay, as part of a comprehensive contract, embracing the whole power station, and Budapest, for whose new station three 23,000-kW turbines have been supplied. All these turbines run at 3,000 r.p.m.

We have chosen examples representing trends in modern practice in which the company is well in the front rank, and it will be correctly inferred that the works capable of producing such striking examples of engineering skill are well able to meet less ambitious requirements, as we would consider them nowadays. In the ELECTRICAL REVIEW of July 12th, 1929, we described the new Peterborough power station, which contains an E.E. Co. 12,500-kW set which typifies the complete range of two-cylinder 3,000-r.p.m. turbines developed by the company during the past five years. A similar machine, fitted to an existing alternator of the company's make at Stockport and put into service at the end of last year, is illustrated in fig. 3. These machines are all of the impulse-reaction type; the impulse design has the advantage of allowing the use of a short and compact construction at the steam inlet suited to the high steam pressures and temperatures in vogue, avoiding as it does fine clearances and balancing dummies, while full use is made of the high inherent efficiency and simplicity of the reaction principle in the lower-pressure stages. In the larger sizes a double exhaust is provided, thus keeping steam exit losses and blade passages low, without fine axial clearances.

Some stress has been laid upon the value of high speed for turbines, but the limiting factor is the speed for which alternators can be safely designed.

In addition to normal turbines, the company has supplied a large number of sets for special steam conditions. Perhaps the most interesting of this class are those designed for use in industries where large supplies of steam are required at low temperatures. The amount of additional coal required for raising steam from a pressure of, say, 30 lb. per sq. in. to a pressure suitable for driving a turbine to generate the electricity required in such works is so small that it is practicable to obtain electricity at the remarkable fuel cost of 0.03d. per kWh when from 150,000 to 200,000 lb. of low-pressure steam is required per hour.

An important installation of back pressure turbines is that supplied to the Victorian Electricity Commissioners. In this case the exhaust (at a pressure of 55 lb. per sq. in.) of two impulse-type 10,000-kW, 3,000-r.p.m., turbines is required for reducing the moisture content of brown coal from 60 per cent. to 14 per cent. The steam conditions are 265 lb. per sq. in. and 725 deg. F.

The possibility of disposing of surplus power to the grid has attracted attention to the exploitation of Scottish water-power resources, but it is not perhaps as widely recognised as it might be that there are already in existence some very imposing schemes in the Highlands, all of which have been laid down by the English Electric Co. Although these schemes include the important installations of the North British Aluminium Co., for which the English Electric Co. has supplied five 9,600-b.h.p. turbines, the British Aluminium Co. (nine 3,200-b.h.p.), Grampian Electricity Supply Co. (two 22,000-b.h.p.) and the Bonnington and Stonebyres power stations of the Lanarkshire Hydro-Electric Power Co. (two 7,000- and two 4,000-b.h.p.), nevertheless they account for only a small proportion of the output of the department, which works chiefly for export. Recent contracts include five 30,000-b.h.p., 375-r.p.m., turbines for the Tata Power Co., Ltd., Bhoria, India, operating under a head of 1,630 ft., one 26,500 b.h.p. for the Sao Paulo Electric Co., Brazil; one 18,000 kW for the Vancouver Island Power Co., and one 12,500 kW for the British Columbia Electric Railway Co., Alonette. The latter is one of the largest completely-automatic power stations yet built. The impulse type of turbine is used for high heads and the reaction type for lower heads. Turbines have been constructed for heads ranging from 94 to 672 ft., and for speeds between 237 and 1,000 r.p.m.

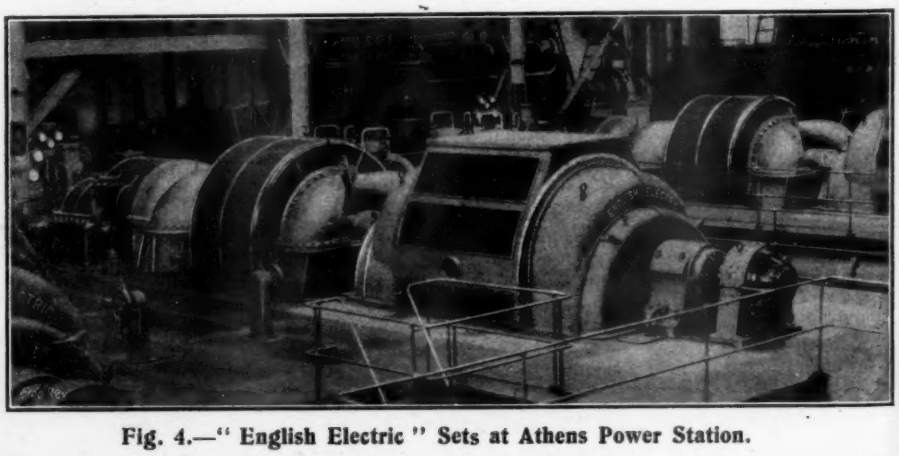


Fig. 4.—" English Electric " Sets at Athens Power Station.

(To be continued.)

Electricity for the Home.

Electric Wash-boilers; Notes on their Design and Construction, with a View to Cost Reduction.

By A CONSUMERS' ENGINEER.

A VERY urgently needed piece of apparatus at the present time is a good, cheap wash-boiler, the lack of which is a hindrance to domestic electrical development. Speculative builders are busy everywhere, and in most of their houses both electricity and gas supplies are being made available. Every pound by which they can reduce their costs of construction is a clear gain to them, and they are tempted, therefore, to put in one only of these services. As, however, buyers will not take a house with gas lighting if electricity mains are anywhere near, there are very few builders who dare to leave electric lighting out. They therefore make arrangements with the supply authority for a lighting supply to be given, but they also put in a gas supply, first, because they feel that their prospective buyers are more familiar with gas appliances than electric ones, and, secondly, because, although they could in most districts leave the provision of a cooker to the buyer, who can hire it from the supply authority, they must themselves supply a wash-boiler, and they hesitate to put one in because of its capital cost. Arrangements are therefore made for a cheap gas boiler to go in, and when that is in the house is well on the way towards being a gas house, to the exclusion of electricity for any purpose other than lighting.

At present prices supply undertakings cannot hire out boilers except at prohibitive or uneconomic rentals, the revenue to be derived from them does not warrant the latter measure, though in some places this is being done.

If an electric boiler could be supplied at a price anywhere near that of a gas one, the builder would put it in and save the cost of the gas service altogether, or, alternatively, hiring would be a reasonable proposition for the supply authority. This would mean that on many new estates gas supplies would not be available at all, and electricity would come into its own, provided, of course, a suitable tariff were offered.

There are quite a number of really good boilers on the market, but the price in every case is such that when the builder balances up the various items of expenditure on apparatus and services he finds that he is a few pounds to the good if he puts in the gas boiler, and in it goes.

One is forced to consider, then, whether or not it is possible for the supply industry and the manufacturers to overcome this position. In view of the fact that the elements and control switch alone will cost about as much as the complete gas boiler, the problem at first sight looks rather hopeless. Mass production of the boiler bodies, however, suggests itself as the first step, and it should not be impossible for manufacturers to get together and decide on a suitable water container, which could be made up, complete perhaps with elements, all ready for assembly in its own outer case, with such auxiliaries or adornments as are individually wished for.

Let us consider, then, what are the essentials of a boiler, and in what form they can be provided. They can be separated into two classes: (1) those with immersion heaters, and (2) those with external heaters. The latter can again be subdivided into two types: (*a*) those with elements clamped to the water container, and (*b*) those with free elements.

With regard to the construction of the inner container or pan, this must be of tinned copper. Galvanised-iron pans have been tried by many, but they were not a success, as sooner or later trouble arose due to the iron-moulding of the clothes. This is a pity, as such a pan is of more robust construction and can be produced at a lower cost than a copper one. It is, however, a position which our gas competitors also have to face.

All joints in the copper pan must be brazed, another costly process. The capacity of the pan should be ten gallons. Pans of eight gallons have been tried, but they are on the small side, especially in the class of house in which the greatest number of boilers will be required, that is, in the homes of the artisan class, in which families of considerable size live and working clothes of a dirty nature need boiling.

A draw-off tap of large bore is needed, unless the pan is to be of the lift-out variety; if such is the case, lifting handles will be needed.

What are the merits and demerits of the three different methods of heating? Let us take them one at a time and deal with the immersion heater first. This type has the advantage undoubtedly with regard to efficiency, but this is offset to a considerable extent by the fact that a quantity of useless water, lying in the sump containing the elements, has to be heated. A sump is essential, and any attempt to avoid it by fixing the heaters in the body of the pan and covering them with an inverted trough will spoil the boiler from the user's point of view. When designing the sump, therefore, it must be made as small as possible, and the heaters must be so placed in it that they can be easily got under and around for cleaning purposes; also the heaters themselves must be easily removable in case of failure. A stout perforated cover for the sump is necessary to prevent clothes getting wrapped round the heaters or the tubes containing them, which might result in their getting scorched. The cover will also prevent the possibility of the stick used in the process of washing being pushed between the heaters and levered against them.

Coming now to the clamped type of element, this has the advantage that the bottom of the pan can, and in fact must, be flat, thereby making the whole of the internal space available for useful water. Against this, the fact that the bottom of the pan will be from twelve to fifteen inches in diameter presents a very big problem by way of the prevention of its buckling or becoming distorted. If such distortion takes place, it is impossible to keep elements in good contact with the bottom of the pan, resulting in loss of time and efficiency, and in increased cost of maintenance. In this connection it must be borne in mind that a repair to this class of boiler does not end with the replacement of the one or more elements which are actually faulty. Clamped elements of this nature, after a little use, become bedded into the little irregularities in the boiler bottom, and when removing faulty ones the others are disturbed, and never again properly re-bed themselves, resulting in a further fault within a short period. There are, further, a greater number of terminals and connections required than is the case with the immersion type, and these are all possible points of trouble, and so are the numerous studs which are necessary for adequate clamping. Perhaps a bigger trouble than all the aforementioned is the damage done if this class of boiler is allowed to go dry under heat; the only satisfactory way of putting it right is to put in a new bottom. Some

very ingenious methods of preventing such a happening have been developed, but they add to the cost of the boiler and, what is worse, although they may function very well when new, they often fail to function at the critical moment. Bear in mind that their moving parts have been in position for months, perhaps years, under the influence of heat, and sometimes of heat and moisture alternately. Corrosion has taken place to a certain degree, and the parts have grown into their positions and refuse to leave them. Even when springs have been incorporated to give the desired impetus, they have been affected by heat and have lost their temper to some extent, and do not therefore give the necessary push or pull.

In one boiler which was put on the market awhile ago, many of these difficulties were surmounted by clamping band-type elements round the lower part of the sides of the pan, which made a cheap and easily repairable job. It requires a straight-sided pan of rather heavier gauge to ensure good clamping, but it has the big disadvantage that the heaters come several inches up the side of the pan, resulting in the scorching of clothes when the water level gets low, and, of course, it still has the weakness due to the possibility of damage to the pan by its boiling dry. Such a pan, nevertheless, has some possibilities.

Turning now to the third type, we straight away cut out all the troubles which arise from clamping the elements to the pan, but we introduce fresh ones by reason of having to use elements with fireclay bases, which are prone to break. The terminals are also in a heat zone, making it almost impossible to remove their nuts without wringing off the studs whenever we have to effect a replacement. In addition, this type requires increased heating time, unless we lag the boiler heavily, with a lower efficiency. Apart from that, repairs can be cheaply made, particularly if a lift-out pan be incorporated. If such a pan is used, however, the elements become accessible when the pan is out, and a risk of shock is introduced, unless some means is provided for preventing the user from lifting it out. If that risk is taken, which after all is not a serious one, a further reduction can be made in cost by eliminating the draw-off tap, but suitable lifting handles will have to be provided, which will eat up some of this saving.

Going over the pros and cons of the three types, one arrives at the conclusion that the best all-round type is that using immersion heaters, always provided that the heaters are so arranged as to be easily removable. The tubular type of heater is a suitable construction, at a fairly low cost. Moreover, assuming that a standard pan can be agreed upon, each manufacturer of boilers would be able to make up his own elements if he wished to do so.

Having decided on a pan, each manufacturer could assemble the boiler in any manner he thought best to secure a market. It could be lagged or unlagged, have a galvanised-iron or other outer jacket, and be with or without a draw-off tap, condenser, or switch.

Reference has been made to efficiency, but it is not regarded as essential that this should be of a high order, and it is unwise to spend a lot of money to secure it. After all, a boiler does not get more than three or four hours' use at a time, and for the greater part of the first hour its temperature is not high enough to occasion serious heat loss. The outer jacket, which must be provided, serves to shield the pan from draughts, and the few per cent. increase in efficiency which can be gained by lagging is not worth its cost. Further, the introduction of asbestos, slag wool, or other lagging material brings in the possibility of corrosion of the outer jacket, which means increased cost of maintenance. As the units consumed per boiler per wash-day amount to not more than ten, and generally less, an increase of ten per cent. in efficiency will not mean more than a penny saved on running costs, and we have nothing to fear with regard to this cost as compared with the average gas boiler.

With regard to the loading of a boiler, 3 kW should be sufficient to provide for 6 gallons of water, sufficient for the start of a wash, to be boiled in less than one and a quarter hours. If a supply of preheated water is available and is used to fill the boiler, this time can be very much reduced. In any event, if the boiler is switched on when the household arises, it is boiling by the time breakfast is over. A further reason for restricting the loading to this figure is that the cost of the circuit is kept reasonably low, as standard 15-A accessories can be used. A loading of 4 kW would, of course, give a quicker first boil, but against that it would give too rapid a boil afterwards. Three kW on three-heat regulation gives just about the heats actually needed.

A condenser, although useful, is not an essential, and should not be included, except as an extra. A vent should, however, be provided, so that a condenser can be fixed if required, or, alternatively, a pipe can be taken from it to atmosphere, through an outside wall.

Years ago our grandmothers used cast-iron boilers, and some of the first electric boilers were similarly made. Their disadvantages were excessive weight of metal, cracking of the pans, and rusting. Nowadays there are processes which claim to eliminate rusting, and foundries can turn out lighter castings of the same strength. Such a pan, fitted with some of the later clamped types of sheathed elements, might conceivably make a good boiler at a reasonable cost, and some enterprising firm might like to try it. The risk of cracking would, however, still be there, and the author, personally, would be rather hesitant about adopting it.

Electrical Wholesalers' Federation.

Annual Dinner.

THE annual dinner of the Electrical Wholesalers' Federation took place at the Savoy Hotel, London, on February 13th. The President (Mr. James Wilson) occupied the chair and there was an attendance of over 300, including the chairmen or representatives of most of the electrical associations, leading manufacturers, &c. The principal toast, after that of "The King," was "Rationalisation." It was proposed by Mr. V. Watlington, chairman of the B.E.A.M.A. Council, who put forward some of the many definitions of the word and traced its origin. He showed that rationalisation was an attempt to improve the "load factor" of an industry by eliminating the inefficient works and fully employing the efficient. It was, moreover, an endeavour to balance production and demand. There would undoubtedly be hardship for a few, but if rationalisatien brought about a revival of industry they should eventually be re-absorbed. Efficient production should reduce, not increase, prices to the consumer and thus improve the demand. Mr. Watlington suggested that the capital of "eliminated" concerns could be repaid from a fund contributed by the efficient and prosperous units of an industry. He admitted that wholesalers were entitled to be paid for what they did and he urged them to strengthen their organisation and make it efficient. If everybody in the industry pulled his weight each would get his proper reward. He maintained that we could not compete abroad with Germany if ten of our firms went to the expense of preparing tenders while Germany was represented by one tender.

Sir Felix Pole (chairman, Associated Electrical Industries, Ltd.), in replying, said that from all definitions of rationalisation there emerged the fact that it was merely the application of common sense in business. He, too, pointed to the waste involved when many tenders were got out for the same plant, and said that if the buyer would not be rational, the producers must join together to make him so.

The health of the Federation was proposed by Mr. P. V. Hunter (Callender's Cable & Construction Co., Ltd.), who jocularly mentioned his strenuous endeavours to find out who the wholesalers were. Mr. Atkinson had told him that they were contractors who had got into a large way of business and had given up wiring for the more lucrative apparatus business, while the contractors informed him that they were philanthropists whose aim was to extend trade discounts to as many people as possible. He maintained that wholesalers were thoroughly rational: they endeavoured to obtain as much profit as they could, which, after all, was the end of rationalisation.

Mr. James Wilson, responding, spoke of the tremendous future for electricity and asked if those in the industry were

doing their best in their marketing methods to strengthen the industrial position of the country. He thought that the answer was in the negative and that a far greater measure of co-operation between manufacturers, wholesale distributors, contractors and retailers was necessary. He hoped that this desirable co-operation would be brought into being before it was forced on the industry by economic circumstances arising from a period of impaired efficiency and impoverishment.

Mr. G. DONOVAN (past-president) proposed the health of the guests. He referred to the damage done to the industry by the pseudo wholesaler (the "brass-plate merchant") and appealed to manufacturers to co-operate with the Federation to eliminate this undesirable class of dealer.

Mr. P. F. CRINKS (chairman, B.R.V.M.A.) thanked the Federation for its hospitality and Mr. P. ROSLING (chairman, C.M.A.) also responded on behalf of the guests, his reply taking the form of a humorous dissertation upon the derivation of the term "wholesalers."

Mr. THEODORE STRETTON (vice-president) proposed the chairman's health and Mr. WILSON responded.

The toast list was varied by humorous items by Miss Doris Lee and Mr. George Duprée.

Instrument Transformers.

Two methods of testing electrical instrument transformers and accessory apparatus for the precise measurement of alternating current.

(Report of a meeting of the METER AND INSTRUMENT SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

AT the February meeting of the Meter and Instrument Section of the Institution of Electrical Engineers a series of three papers dealing with the subjects outlined in the above sub-heading was presented for discussion, the investigations described in two of them having been carried out at the National Physical Laboratory. The following are extracts from the papers :—

A New Testing Method.

A paper by Mr. G. F. Shotter, A.M.I.E.E., describes some of the common methods and the author's own new null method of testing instrument transformers. The latter is based on the double-wattmeter method, but with important modifications which are claimed to eliminate all its disadvantages. Instead of reading the difference directly from the instrument, the potential circuit of one of the elements is so arranged that resistance can be added to or subtracted from this circuit until balance (shown by null deflection of the pointer) is obtained on the instrument. When the final point of balance is obtained, this fact is apprehended by means of a tapping key inserted to make or break the common potential circuit to the instrument. When using an ordinary standard wattmeter (2½ A; 100 V) with this modification the sensitivity was increased ten times; with a specially constructed wattmeter, such as that described by Mr. Spilsbury, the sensitivity can be increased fifty times, *i.e.*, a sensitivity of one part in 25,000 can be obtained at full load, giving a sensitivity of one part in 1,250 at 1/20th full load and unity power factor, against one part in 250 when using a standard wattmeter.

If the common potential circuit to the wattmeter is excited from a source of e.m.f. which is in phase with the current in the common primary circuit of the current transformers, the resistance added to, or subtracted from, the potential circuit is a measure of the difference of ratio between the known and unknown transformers. The angle error of a transformer can be obtained if a second test is carried out with the source of e.m.f. to the common circuit of the wattmeter displaced 60 deg. from the current in the common primary circuit.

The advantages which can be claimed for the method may be summed up as follows :—It reduces calculation to a minimum and, being a null method, it can therefore be operated by non-technical testers. The error is read directly from the testing-box dials.

It is accurate and sufficiently sensitive for most commercial requirements, and is the only method, so far as the author is aware, which with the same apparatus can be used for testing both current and potential transformers. A minimum of apparatus is required, and it allows rapid operation. The actual time taken to test six transformers for ratio and phase-angle error at one burden on four transformers, and two burdens on two transformers, is approximately 45 minutes, including load setting, but excluding the time taken in connecting the apparatus and transformers. It is the only British test equipment for instrument transformers.

An interesting application of the method is the testing of power transformers for ratio and the determination of the regulation curve. A possible application is for testing the losses of power transformers; also in conjunction with the Kapp modification of the Hopkinson efficiency tests on d.c. machines, while other applications of the method might be developed, *e.g.*, its use for determining the efficiency of a rotary convertor.

The author thanks the chief engineer of the North Metropolitan Electric Power Supply Co., Captain J. M. Donaldson, for permission to publish results of tests made in the company's laboratory.

Precision Testing.

A paper by Mr. A. H. M. Arnold, Ph.D., A.M.I.E.E., describes in detail how the testing of current transformers may be carried out with speed and accuracy by means of a potential-divider bridge. The corrections to be made to the readings are deduced from the theory of the bridge.

In 1913-14 two papers were published in Germany describing a bridge method of testing current transformers.* It was simple to use and had the further advantage that it could be made direct reading. The accuracy attainable was of the order of 0.1 per cent. for ratio. That attainable in the phase-angle measurement would depend to a large extent on the design of the component parts of the apparatus and on the care taken in the set-up to avoid trouble from magnetic and electric fields. It would probably be of the order of a few minutes, and for most work this accuracy is ample. The advent of high-precision current transformers with "Mumetal" cores has, however, created a demand for testing to a higher degree of accuracy. An investigation was therefore carried out at the National Physical Laboratory to determine whether this method was capable of giving greater accuracy. It was found that, provided certain precautions were taken, it was possible to determine the ratio of transformers to 0.01 per cent. and their phase angles to 0.1 minute (0.00003 radian). It is, however, impossible to attain this accuracy and, in addition, to make the apparatus direct reading, but the latter principle has not been entirely sacrificed, for it is possible by the use of a few small correction terms to correct the direct readings of ratio and phase angle in order to obtain the true values.

At the same time, a modification of the method was developed which has greater sensitivity and is capable of rather greater accuracy. The two methods are useful as a check on one another. The greater sensitivity of the modified method makes it very useful for studying small changes in the characteristics of transformers or for determining their stability. It is not direct reading and is not quite as flexible as the original method. The method developed in Germany has been adopted by the National Physical Laboratory for outine test work, and the modified method developed at the National Physical Laboratory is used only for special work and as a check on the former method.

The development of this apparatus to give the above-mentioned accuracy has shown that the characteristics of well-designed transformers are quite stable to this limit. Another paper (below) shows that the characteristics of well-designed mumetal transformers are stable, at least to the limit of sensitivity of the testing apparatus. From this point of view, therefore, the increased accuracy is justifiable.

Accessory Apparatus.

A paper by Mr. R. S. J. Spilsbury, B.Sc., A.M.I.E.E., and A. H. M. Arnold, Ph.D., A.M.I.E.E., describes some accessories for the precise measurement of alternating current; that is, to facilitate obtaining a small voltage proportional to, and in phase with, the given a.c. to be measured.

The introduction outlines defects in the water-cooled tube resistors which have been in use at the National Physical Laboratory for this purpose; the defects have led to the construction of air-cooled resistors for moderate currents, and current transformers with nickel-iron cores for heavy currents. Section (1) of the paper deals with the requirements for the air-cooled resistors, and with theoretical and practical points in their design; tests showing very satisfactory performance are described. Section (2) outlines the construction of the special current transformers, and deals at some length with the method of calibrating them. Finally, the effects of a number of variables on the transformer performance are investigated : the characteristics are shown to be very good, and no sign of instability has been found.

In view of the doubts which have been expressed with regard to the stability of "Mumetal," the results recorded in this paper are of considerable interest, for they suggest that a transformer with a "Mumetal" core can be at least as stable as one in which silicon iron is used.

* E. Alberti and V. Vieweg : "Archiv für Elektrotechnik," 1913, Vol. 2, p. 208; also H. Schering and E. Alberti, *ibid.*, p. 263.

High-pressure Steam.

Notes on the construction and operating experience of extra-high-pressure steam turbo-alternator plant installed and under construction in electricity generating stations in America.

(*Extracts from a paper read before the* INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.)

IN a paper recently read by Mr. W. Patchell on behalf of the authors, Messrs. I. E. Moultrop (chief engineer of the Edison Electric Illumination Co.) and M. D. Engle (of the station engineering department of that company) stated that they had had four years' experience of commercial installations operating at a pressure of 1,200 lb., and during that time had learned many things which had greatly aided them in the development of apparatus for such pressures. The original 1,200-lb. installation was still operating and proving a profitable undertaking for the company which owned it. The utilisation of pressures of 1,200 lb. and above was seriously considered in laying out practically all new steam-electric generating stations in the United States. Furthermore, such pressures were being seriously considered for many major extensions to existing stations where the operating companies were looking for greater economies.

Super-imposing high-pressure equipment on normal-pressure stations, by using high-pressure turbines to expand the steam from the boiler pressure to the pressure of the main steam-header of the normal pressure portion of the station, was the logical arrangement for the early stages in the development of the high-pressure equipment, but, with one exception, all of the later high-pressure stations under construction had adopted high-pressure compound turbines where the pressure at the exhaust of the high-pressure turbine was allowed to vary with the load, and all of the governing was done by the 1,200-lb. governor. The first of those stations was to go into service early in 1930, and they would watch its performance with interest, for they were not at all sure that the change was desirable.

The high-pressure stations under construction at the present time were: Deepwater, of the United Gas Improvement Corporation and the American Gas & Electric Co.; Holland, of the W. S. Barstow Co.; South Amboy, of the Jersey Central Power and Light Co; station "A" of the Pacific Gas & Electric Co. and the River Rouge plant of the Ford Motor Co. In addition to those, a 1,200-lb. reducing-valve turbine installation was to be placed in the generating station of the Houston Light and Power Co. at Houston, Texas.

Water-cooled furnace walls were very expensive and there was a real need of a suitable furnace wall which would not impose such a severe financial burden. The latest design was quite a radical departure; the boiler was single-deck and single-pass, and all tubes had an outside diameter of 3¼ in. The economiser was increased in size to take the place of the second and third passes of the boiler, and a considerable saving in the cost of construction was effected. The reheater was removed from the boiler setting and placed beside the economiser. A new type of 1,200-lb. superheater was adopted to obtain better distribution of the steam between the various elements, and the superheater headers were removed from contact with the boiler flue gases. That was regarded as a distinct improvement commercially over previous designs. The reason for the change was to obtain a high-pressure steam-generating unit at a lower cost, which purpose had been accomplished; in addition, it was much better from the operating standpoint.

Two types of reheater were being employed for reheating the steam leaving the exhausts of high-pressure turbines. In the gas reheater the heating medium was the boiler flue gases, while the other type employed 1,200-lb. steam. With the gas reheater, the steam could be reheated to just as high a temperature as the materials in the reheater, piping, and turbine would stand, while with the steam reheater the maximum reheat temperature was somewhat below the saturation temperature of 1,200-lb. steam; usually a reheat temperature of about 550 deg. F. was obtained. Undoubtedly, the steam reheater resulted in a simpler and less expensive layout, but the difference in economy of the lower-pressure turbine when supplied with steam at 550 deg. F., as compared with 750 deg. F., would justify considerable expenditure.

The latest 1,200-lb. plant installed had 5-valve 14-stage turbines, and a capacity of 12,500 kW.

Some of the later high-pressure stations in the United States were utilising an ingenious arrangement of turbine and generator; the high-pressure turbine and its generator were mounted directly on the generator driven by the low-pressure turbine. A considerable reduction in floor space requirements had been obtained, and undoubtedly a saving in the cost of foundations. Where live-steam reheaters were used, that design permitted the use of very short steam leads between the two turbines. The Ford Motor Co. had ordered a 110,000-kW, 1,200-lb. set of the vertical compound design. Since the steam must be reheated at the point in the expansion where it approached saturation, the power generated by the high-pressure turbine was greater than the capacity of generators of 3,600 r.p.m. available to-day, and so it was necessary to operate the high-pressure element at 1,800 r.p.m. At that speed, the high-pressure turbine and generator were too large to be mounted on the generator driven by the low-pressure turbine; consequently, the high-pressure turbine would be mounted on top of the low-pressure turbine, a radical departure in design. None of the vertical compound sets were in operation as yet.

When it became necessary to design boiler feed-pumps for a capacity of 900,000 lb. per hour for the second high-pressure installation in the Edgar station, variable-speed alternating-current motors of the size required were not available at 3,600 r.p.m. It was, therefore, necessary to design the pumps for a maximum speed of 1,800 r.p.m. and to use four in series. The primary sets consisted of a single-stage and 5-stage pump coupled together and driven by a 625-h.p. motor; they pumped the water from the deaerator, at a pressure of about 25 lb., and discharged it at 450 lb. per sq. in. through the high-pressure heaters to the suctions of the secondary 5-stage and 6-stage pumps driven by a 2,030-h.p. motor, which pumped the water to a maximum of 1,600 lb. These pumps were of the solid-barrel type, vertically split at each end.

The use of X-rays for the inspection of thick castings at the points where flaws were most likely to occur had materially reduced the number of casting leaks by permitting the rejection of porous castings before their installation; such inspection had prevented serious delays in placing high-pressure apparatus in service, and had resulted in much safer and more reliable installations. In spite of all precautions, however, some defects had shown up. By the use of welding, many castings had been salvaged; in fact, some which were seriously defective had been repaired and had operated satisfactorily for extended periods while new castings were being obtained. The seal-welding of flanged joints had practically eliminated leaky joints and they were now seal-welding all joints, even the smallest.

One of the surprising facts was that 1,400-lb. safety-valve and reducing-valve seats did not cut rapidly; they held tight for as long a period as 350-lb. valves. Their principal difficulties had been with the apparatus which was not affected by the pressure and with some of the small miscellaneous apparatus subjected to the high pressure.

The opinion that the skill required to operate a high-pressure station was considerably greater than that required to conduct a normal-pressure station was not correct. When it came to maintenance, however, it was possible that the high-pressure station did require greater skill. If the job was done properly in the first place, however, any additional maintenance skill that might be required should not be an important consideration.

They could definitely say that the commercial possibilities of higher steam pressures had been demonstrated and operating records showed that the expected gains in thermal efficiency had been obtained in practice. No insurmountable difficulties were inherent in the higher pressures. As to the relative costs of high-pressure and normal-pressure stations, in the authors' opinion there was practically no difference if the design of the high-pressure station was correct. If a high-pressure station could be built for the same unit cost as a normal-pressure station, such a station was then justified for carrying the normal system load. If the high-pressure station cost considerably more, then high-pressure generating equipment should only be installed to such an extent that it could be operated at a load factor high enough to make the undertaking profitable. One of the most advantageous places for the installation of high-pressure equipment was in extensions to existing stations, as it could be given load preference, and a very material improvement in the coal rate of the station would result therefrom. The authors made that point particularly, because some engineers hesitated to change the operating pressure when extending an existing station. They preferred to wait until they started a new station, and yet quite often the latter could not be worked at as high a load factor as the extension because of transmission facilities or system operating requirements.

Was the pressure of 1,200 lb. the most economical? The answer was that the operating steam temperature really determined the economical pressure, and when apparatus had been

developed for working at considerably higher temperatures the problem of deciding whether again to raise the operating pressure would have to be faced.

The use of 1,200 lb. at 700 deg. F. with one stage of reheat to 700 deg. F., as compared with straight expansion from 350 lb. at 700 deg. F., resulted in a theoretical increase in economy of between 14 and 15 per cent. When the additional power required for pumping and the other losses due to the higher pressure were deducted, a net gain in economy of about 12 per cent. was realised. If that gain could be obtained without an undue additional capital burden due to the cost of construction, the increase in pressure was very much worth while.

Legal.

" Lectro Linx " Patent Action.

IN the Chancery Division on February 11th Mr. Justice Clauson began the trial of an action by Messrs. A. E. Chapman, C. R. Cook and Lectro Linx, Ltd., of Vauxhall Bridge Road, against the Deltavis Company, Voleure, Switzerland, for an injunction restraining the alleged infringement of the plaintiffs' patent No. 231,280 for improvements in electric couplings, terminals and the like. The plaintiffs also asked for delivery up for destruction of the alleged infringing articles and damages. Infringement was denied and the defendants pleaded that the patent was invalid on the grounds of prior publication and prior common general knowledge. Mr. RUDOLPH MORITZ, K.C., for the plaintiffs, said that at the date of the issue of the writ the registered owners of the patent were the first two plaintiffs, but it was afterwards assigned to the third plaintiff. On the plea of invalidity the issues raised were want of novelty, want of subject matter, and inutility. The patent dealt with small electrical connections. One of the most fruitful sources of trouble in radio sets was the difficulty of making good small connections of a temporary character. If the connections were not properly made, small and variable resistances were set up at the points of contact which produced unpleasant crackling noises. It was thought that a split pin would make a tight joint, but it did not work out that way in practice. In the particulars of objection filed by the defendants there was shown a variety of ways of reaching the same result, but it was the plaintiffs' method that solved the problem and was now a commercial success. Probably tens of millions of the type were in use because the plaintiffs' patent had been universally infringed. The plaintiffs produced a pin which was bevelled off at the lower end and was hollow and had six slots milled down its length in such a way that they terminated before they got to the tip. Thus when pressure was applied to it there was a surface contact all over the pin which made a perfect connection. The defendants' contention was that the plaintiffs were claiming a patent for a coupling which consisted of a plug and socket and not for a pin alone which they alleged invalidated the patents. But he (Counsel) submitted that the pith of the invention was the two-ended suspension of the hollow centre of the pin or plug and that there was infringement even if the plug was omitted. In support of their plea of lack of novelty and subject matter the defendants had cited prior specifications of Shiels, Stott, a Dutch company, Pellant, Arnold and Bosch.

Mr. JAMES SWINBURNE, consulting engineer, gave evidence in support of the plaintiffs' case and the case was adjourned.

The hearing was continued on February 12th. Mr. James Swinburne concluded his evidence, and he was followed by other witnesses for the plaintiffs

Mr. J. WHITEHEAD, K.C., opening the case for the defence, said what the patentee claimed was a spigot made on a new and fundamental principle, and which was of great utility and vast commercial success, *viz.*, a leaf spigot held at both ends, in contrast to a spigot held at one end. But it had been clearly laid down by the House of Lords that if a patentee was seeking to make use of a so-called new principle, it must be made plain in the specification that it was the principle that was being claimed. Yet nowhere in the plaintiffs' specification was that principle pointed out. The invention was the provision of a plug and socket contact formed as a single unit and provided with leading-in means. He called Mr. Hubert Alexander Gill, chartered patent agent, to give evidence. The hearing was again adjourned.

Mr. TREVOR WATSON summed up the defendants' case on February 14th. On the question whether the Deltavis pin infringed the plaintiffs' patent, he said an attempt had been made by the plaintiffs to show that, although the Deltavis pin was not an infringing article when made, it might, by being pressed into a parallel-sided socket, become an infringing article by compression. But there was no evidence that the defendants had ever put one of their plugs into a socket. If such a plea were of any avail it would be against the user only.

Mr. MORITZ replied on behalf of the plaintiffs.

Giving judgment, his LORDSHIP said that on his view of the construction of the plaintiffs' specification he could not hold that the claim was one for a coupling formed of a plug and socket as a unit and also as a claim to a monopoly for a particular form of plug. The patentee had told them of no invention except that which was comprised in a combination of a socket and pin. Therefore there was no grant of a monopoly for a particular form of pin, and on that view, said his Lordship, there was no infringement, and the action would be dismissed with costs.

Symphony Gramophone and Radio Co., Ltd.

THE petition of the Plessey Co., Ltd., Ilford, for an order for the compulsory liquidation of the Symphony Gramophone and Radio Co., Ltd., again came before Mr. Justice Maugham in the Companies Court on February 10th.

Sir GERALD HURST, K.C., for the petitioners, said they were creditors for £44,000. The petition had been adjourned and a meeting of creditors had appointed a committee which had outlined a scheme to raise further capital to satisfy the creditors. Support for the scheme was promised by creditors for £31,000, while among those who opposed the scheme was the Marconi Co., creditors for £29,919. The petitioners were willing that the petition should stand over again so that the scheme should be considered.

Mr. GAVIN SIMONDS, K.C., for creditors for £27 000, opposing the petition, said he understood that the Marconi Co. was prepared to consider the scheme.

Mr. J. N. GRAY, for creditors supporting the petition, said he was instructed that the scheme would give preference to certain creditors to the detriment of others.

Mr. LINDEN, for 64 holders of £470,000 shares, said they would be prepared to provide further financial assistance under certain conditions.

His LORDSHIP adjourned the petition for three weeks.

Parliamentary News.

(By our Special Parliamentary Reporter.)

Criticisms of the Post Office.

On February 12th, Mr. RAMSBOTHAM, a Unionist member, called attention to the condition of the postal, telegraphic, and telephone services, and moved a resolution to the effect that a committee of inquiry, consisting principally of business men, should be constituted for the purpose of reporting on the administration of these services, and also as to whether they should be transferred from the Post Office to a public corporation. He said that the telegraphs showed a loss of £728.000. The Hardman Lever Committee recommended that a competent engineer with administrative experience should be appointed to the telegraph system. So far as he knew, such an engineer had not been appointed, the reason being that the salary offered was not high enough. The telephones made a profit of about £500,000. Anyone who compared that figure with the gigantic profits made by the Bell System in the United States would be astonished at the disparity. Our telephone costs, he understood, were about twice those of Continental countries. It was an appalling fact that this country should be only tenth among the telephone users of the world. Telephones and telegraphs should be taken out of the hands of the Post Office and put under a separate administration. Mr. MOND seconded the motion.

Mr. BOWEN, Labour, moved an amendment declaring that " the continuation of the present high standard of these services is dependent upon the maintenance of the Post Office as a national institution subject to the control of Parliament."

Lord WOLMER supported the motion and Mr. LEES-SMITH, the Postmaster-General, said that the finance of the telephones was far sounder than the finance of most of the staple industries of the country. If the service had been in private hands a few years ago it would undoubtedly have suffered from over-capitalisation. He did not say that the Post Office had no faults, but so far as faults were revealed, the Post Office system enabled them to be corrected more rapidly than faults were corrected in private industries outside.

The motion was rejected and the amendment carried.

A Delayed Wessex Scheme.

On February 13th Major GLYN asked the Minister of Transport if he could now make a statement as to the reason for the prolonged delay by the authorised undertakers, the Wessex Power Co., in carrying out contracts and obligations for the supply of light and power in various towns and villages in North Berkshire; whether he could state the reason why officials who were dealing with various residents and local authorities on behalf of the authorised undertakers had in many cases left the district, thus causing much delay and extra work; and whether the Electricity Commissioners would take the necessary steps to investigate the situation and report to the Minister of Transport.

Mr. MORRISON said that the area of supply of the company had been divided into three main portions for the purpose of the submission of schemes of development to the Electricity Commissioners. A scheme for the first portion had been submitted and approved and was in process of being carried into effect. A scheme for the second portion, comprising North Berkshire and other areas, had been submitted, but the Commissioners had asked for certain amendments and extensions

which were at present under discussion, and the Commissioners had also asked the company to expedite the preparation and submission of its scheme for the remaining portion of the area. He had no information with regard to the point referred to in the second part of the question, but, as regarded the future, the Commissioners believed that now that the Central Board's regional scheme for main line transmission had been published, development should be expedited, and they were keeping in touch with the company in the matter.

Municipal Trading.

On February 14th, the Local Authorities (Enabling) Bill, which gives to local authorities wide powers in the matter of municipal trading in a number of commodities, was read a second time by 150 votes to 124. It is unlikely to get much further this session, however. The Bill was introduced by Labour members, many of whom, in support of their arguments, quoted the success of municipal electricity undertakings.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

A New Accumulator Works.

The appearance of a new accumulator manufacturing concern will be of general interest to the electrical industry. We have received a catalogue of stationary lead batteries from Britannia Batteries, Ltd., who have recently established at Redditch, near Birmingham, a factory equipped with the latest plant and machinery. Besides lead accumulators of all kinds and sizes, the company is manufacturing nickel-iron-alkaline accumulators for Edison Accumulators, Ltd. Accumulators of the Edison type have hitherto been imported from America, and are now being made in this country for the first time. The "Pertrix" dry battery for wireless use and for flashlamps, is also made at the Britannia Works. The "Britannia" lead accumulators are based on the designs of the A.F.A., which has a practical and technical experience extending over forty years. The stationary batteries described in the catalogue include a number of definite improvements. The wood separators are supported by imperishable ebonite rods, instead of wood rods. An improved process of casting the positive plates eliminates buckling to a large extent. The depth of the boxes is increased, allowing more mud space below the plates and more acid space above. The larger cells in glass boxes are mounted in double boxes, which reduces the risk of breakage of boxes and avoids a shut-down of the battery in case a box does break. The company intends to issue shortly catalogues dealing with motor-car starter batteries, vehicle batteries, wireless batteries, and other types which it is developing.

Crossleys in Ceylon.

Messrs. Crossley Bros., Ltd., have sent us a photograph showing one of their engines being conveyed by elephant transport to the mills of Messrs, J. H. Vavasseur & Co., Ltd., at Kurunegala, Ceylon. The engine has a rating of 85 b.h.p. and will be supplied with gas from a "Crossley" gas-producing plant using cocoanut shell charcoal as fuel. The weight of the equipment is 4½ tons.

A South African Electrical Development Association.

A national association to promote the greater use of electricity in South Africa and Rhodesia, which has been discussed for some time, is now being formed, mainly through the efforts of Mr. H. J. van der Bijl, Ph.D., chairman of the Electricity Supply Commission. It will be known as the Electrical Development Association of South Africa, and its organisation will be based on that of the British Electrical Development Association, adapted to local circumstances. The new Association, by propaganda and advertising, will seek to make South Africa think electrically in the home, in agriculture, and in industry and commerce. Its activities will include representation at exhibitions and agricultural shows. The headquarters will be at Johannesburg, in charge of a managing director, and in time it is hoped to have branches at Cape Town, Durban, and other centres, as well as in Rhodesia, with permanent showrooms and lecturing facilities. If the various interests now being approached—which include electricity supply undertakings, manufacturers or their representatives, wholesalers, retailers, and contractors—join the scheme, as is expected, the Association will have an income of £9,000 a year.

Unemployment.

There was an increase of 17,081 in the number of registered unemployed during the week ended February 3rd, at which date the total was 1 508.600, as compared with 1,491,519 on January 27th, and 1,369,475 on February 4th, 1929.

An American Report on Malaya.

The United States Trade Commissioner in Singapore states that during the past year the British Malayan trade in electrical apparatus was active, imports continuing the upward tendency of recent years, and increasing 22 per cent. over 1928. British manufacturers secured most of the trade on account of the extensive hydro-electric development in the State of Perak. Electrical business, however, is expected to decline during the current year. Automatic telephones were installed in Singapore, and funds were appropriated for the erection of a trunk system connecting Singapore and Penang. Work is to commence next autumn. Radio development in British Malaya was meagre during the past year.

Ex-British Westinghouse Association Dinner.

The 12th re-union dinner of the Ex-British Westinghouse Association, will be held on March 14th at the Hotel Cecil. Tickets, price 15s. each (2s. 6d. for subscription) can be obtained from Mr. L. S. Hawes, hon. treasurer, 51, Fontenoy Road, Balham, S.W.12.

The G.E.C. in India.

The General Electric Co., Ltd., announces the opening of two new branches in India as follows:—The General Electric Co. (India), Ltd., 7, Brigade Road, Bangalore, Mysore State, and the General Electric Co. (India), Ltd., Main Road, Trivandrum, Travancore State.

American Company Acquires Continental Telephone Concerns.

The Berlin correspondent of the *Financial News* says that in connection with the transaction carried out in Germany by the Standard Elektricitäts Gesellschaft of Berlin (which has acquired the control of the Telephonfabrik Berliner Co.), the Standard Electric Co. of New York has acquired the majority of the shares of the Oesterreichische Telephonfabrik, formerly a Vienna subsidiary of the Berliner Co.

Marconiphone Window Displays.

During Radio Week, the Marconiphone Co., Ltd., held a £100 window display competition, the report of which is now available. The prizes were allotted as follows:—1st prize: Mr. H. Sayner, 28-30, Saltaire Road, Shipley. 2nd prize: Messrs. R. Barker & Co., Ltd., 4, New Station Street, Leeds. 3rd prize: Messrs. Neal & Bacon, 64, St. Benedicts, Norwich. 4th prize: Messrs. Tamplin & Makovski, Bell Street, Reigate, Robert Hazelton, Woodhouse Street, Portadown, Radio House, 17, Union Street, Plymouth, and Guy V. Laycock, 12, Cloth Hall Street, Huddersfield.

Works Visit.

On February 7th, about 150 members of the Institution of Municipal Engineers paid a visit to the works at Dagenham Dock, Essex, of Pritchett & Gold and E.P.S. Co., Ltd. On arrival at the works, the vistors were formed into parties of ten, each party being conducted through the works by a qualified engineer. They were taken through the whole process of battery manufacture, from the refining of lead to the packing of the finished article. Particular interest was shown in the casting of plate grids, plate pasting, the moulding of "Dagenite" boxes, and in the making of unspillable batteries for portable wireless sets. At the conclusion of the tour of the works, the visitors were entertained to tea.

A Birmingham Electrical Exhibit.

We reproduce herewith a photograph of the Birmingham Electric Supply Department's stand at the Brighter Homes Exhibition, which is being held in Bingley Hall, Birmingham, from February 6th to 22nd. This Exhibition was organised by the *Birmingham Gazette*, and is being visited by thousands of people from Birmingham and the Midlands. The stand contains a selection of electric lighting fittings and shades; a

Electrical Appliances at the Brighter Homes Exhibition.

group of modern electric fires; improved patterns of electric cookers as supplied on hire and hire-purchase terms by the Department; tubular heating apparatus suitable for green houses, halls, &c.; modern electric water heaters; also immersion heaters suitable for insertion in existing hot water tanks; electric wash boilers and washing machines; vacuum cleaners, irons, kettles, refrigerators, and other modern electric domestic labour-saving appliances.

Proposed Indian Tariff on Refrigerators.

In the Indian Legislative Assembly last week, Sir George Rainy, the Member for Commerce, introduced a Bill proposing certain tariff changes. Among other things, the Bill provides that domestic refrigerators will be liable to a 15 per cent. *ad valorem* duty irrespective of the mode of operation.—*Reuter* (New Delhi).

The North-Western Area Council and Board.

At a recent meeting of the newly-elected District Council (Electricity Supply Industry) for the North-Western Area, Ald. T. E. Higham (Accrington) was appointed chairman for the eleventh year in succession, and Mr. J. T. Watkins was re-appointed vice-chairman. A welcome was extended to the two new members on the employers' side, Aldermen Billington (Salford) and Freeman (Oldham).

A similar meeting took place, on the same day, of the District Joint Board for the area. Alderman T. E. Higham was appointed chairman, and Mr. G. E. Smith (Barrow) vice-chairman. In the absence of Alderman Higham, Mr. Smith occupied the chair. A welcome was extended to the new member on the employers' side, Alderman E. Porter (Blackburn). After the meeting Mr. J. W. Thomas was presented by Alderman Walker, on behalf of the Board, with a reading lamp. Alderman Walker referred to the fact that Mr. Thomas had now severed his connection with the Board, of which he had been a member since its constitution some ten years ago. He also referred to the academic distinctions which had been attained by Mr. Thomas under difficult circumstances, due to the heavy demands on his time which his official duties had occasioned.

Social Events.

A company of over 400 employés of the Shropshire, Worcestershire and Staffordshire Electric Power Co., were entertained at their fifth annual dinner by the company, at Dudley Town Hall on February 8th. Representatives were present from all parts of the company's area which now embraces about 2,500 sq. miles. Mr. T. E. Boothby, power stations engineer for the company, presided, and was accompanied by Mr. J. T. H. Legge, managing director, the Mayor of Dudley and the Chief Constable. Welcoming the guests, the chairman said there had been further additions to the company's operations since they last met, and he welcomed particularly new members from the Hereford undertaking. Mr. A. S. Woodhall, proposing the toast of the company, said it was operating in nine counties, which meant there was a danger of centres becoming isolated units instead of links in a chain. He thought the time had arrived for the constitution of an area industrial welfare committee, which would promote co-operation between all the centres. Responding, Mr. Legge said that in connection with the employés' provident fund, there was now over £15,000 to the credit of depositors. In the endowment fund the total amount standing to the credit of members at the end of last year was £14,058. He approved the suggestion of a central welfare committee.

The "Fourth Wall," by A. A. Milne, was performed by the Metropolitan-Vickers Dramatic Society at the M.-V. Club on four nights, beginning on February 5th. It was a very successful production, the actors and actresses (all on the company's staff) playing their parts naturally and cleverly. Appreciative audiences witnessed each of the four performances.

On Friday last the staff and friends of the Sheffield office of the Metro-Vick Supplies held their annual supper dance at the Tudor Café, Sheffield. A whist drive was held, followed by dancing and supper. Short speeches were given by Mr. P. F. Crinks, the general manager, Mr. E. G. Sellers, the District Manager, and Mr. R. G. MacLaverty.

The Economic Council.

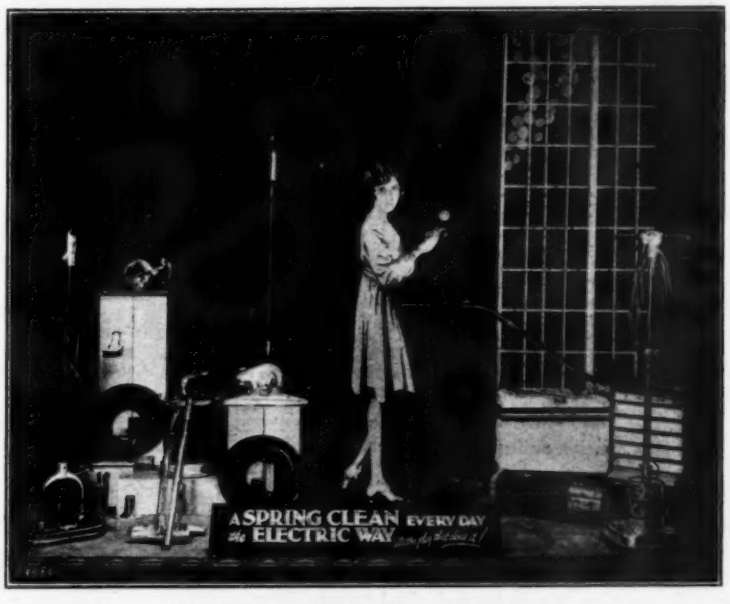
In the House of Commons last week the Prime Minister announced the names of the members of the Economic Council, which, as we reported in our issue of February 7th (p. 251), is to act in an advisory capacity to the Government upon economic questions. The names included Sir Arthur Balfour, who was chairman of the Government Committee on Industry and Trade, 1924, and Sir Andrew Duncan, chairman of the Central Electricity Board.

New Municipal Showrooms.

The Colchester Electricity Department opened new showrooms in High Street on February 12th. There were demonstrations of cooking, washing, water heating, &c., and a representative display of fittings, fires, irons, &c.

The E.D.A. March Programme.

With the approach of spring, the British Electrical Development Association in its programme for March draws attention to the spring cleaning period and the opportunity afforded for either installing electric light or extending an existing installation. This is emphasised by the accompanying illustration of a window display, which is reproduced from the programme, in which the electric vacuum cleaner is given prominence. This relies upon a simple home setting as its main feature of attraction, and the window is first covered with pale green crêpe paper, the home window effect being obtained by setting aside a portion of the background to be used as an imitation window; this is then covered with pale blue crêpe paper, and the window panes are obtained by making use of strips or



The E.D.A. March Window Display.

tubes of white crêpe paper. Three sprays of artificial foliage are used to secure the decorative effect. The programme also contains examples of E.D.A. advertisements in the national and local Press during March, for which a coloured lantern slide to link with local Press announcements is available, a new poster, and a list of publications. A calendar of local activities in connection with the E.D.A. Electric Homes (Outlet) Campaign is also given, together with some notes by the director.

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New Zealand's Electrical Imports.

The *Board of Trade Journal* reports that during the September quarter of last year New Zealand imported electrical machinery and equipment valued at £484,636, as compared with £533,886 in the corresponding quarter of 1928. Of this total the United Kingdom was responsible for £244,394 (against £309,576), the United States for £145,245 (£105,222), Canada for £42,123 (£40,821), and Australia for £13,887 (£7,944).

Central Electricity Board Contracts.

The Central Electricity Board has placed contracts, amounting in all to approximately £150,000, for 132-kV transformers in the area of the Mid-East England Electricity Scheme, with the following companies: Messrs. Ferranti, Ltd., the Fuller Electrical and Manufacturing Co., Ltd., and the General Electric Co., Ltd.

A Women's Electrification Course.

Last week 130 members of the electrical industry, mainly women, attended a special practical course on home electrification at the London Lighting Service Bureau. The course was planned for the assistance and instruction of those engaged in the demonstration and selling of domestic electrical appliances and it covered a wide and interesting field. Miss C. Haslett, director of the E.A.W., gave an opening address on February 12th, and subsequently the following lectures were delivered: "The History and Geography of the Electrical Industry," by Lt.-Col. W. A. Vignoles, director of the B.E.D.A.; "Modern Views on Electric Lighting," by Mr. W. J. Jones, manager of the Lighting Service Bureau; "Lighting Fundamentals and Control," by Mr. H. Lingard; "A Well-lighted Home," by Miss A. Jackson; "The Production of Colour and its Application," by Mr. L. E. Buckell; "Architectural Lighting," by Mr. R. W. Maitland; "Wiring Installations for Lighting and Power and How to Use Them," by Mr. R. W. Kennedy; "E.D.A. Home Wiring Specification," by Mr. J. I. Bernard; "The Construction and Use of Domestic Appliances," by Mr. H. Bourne; "The Construction of the Modern Electric Cooker," by Mr. J. I. Bernard; "Tariffs and Load Factor," by Lt.-Col. W. A. Vignoles; "Room Heating and Water Heating," by Mr. W. B. Leigh; "Showrooms for Electric Lighting," by Mr. T. Catten; and "Salesmanship Demonstrations and Discussions," by Miss G. Burlton. There was also an open discussion on electric cooking, including temperature control. The proceedings concluded with visits to the Westminster Electric Supply Corporation's and the Battersea Borough Council's electrical showrooms.

The E.D.A.-E.L.M.A. Home Electrification Course: the Students outside the I.E.E. Building.

Hire-purchase Finance.

At an extraordinary meeting of the United Dominions Trust, Ltd., on February 12th, called to consider resolutions in connection with the company's arrangements with the Bank of England, the chairman, Sir Edward Mountain, said that their hire-purchase financing business was chiefly connected with the engineering, the motor and allied trades. They proposed to give special attention to the financing of electrical appliances and plant, including even wiring.

Large Soviet Electrical Organisation.

The board of the Supreme Economic Council of the U.S.S.R. has confirmed the statutes of the new large central electricity organisation "Energotsentr," which combines the Moscow, Leningrad, and Nizhni-Novgorod unions of electric power stations and other bodies, including several joint-stock companies. The capital of the new concern is provisionally fixed at 1,200,000,000 roubles (£120,000,000).—*Reuter's Trade Service* (Moscow).

Our Overseas Electrical Trade.

The following were the values of imports and exports of electrical goods and machinery from this country during January, 1930:—

	Jan., 1930.	Inc. or dec. compared with Jan., 1929.
Imports.		
Electrical goods and apparatus	743,877	+302,436
Machinery ... ... (Including electrical machinery)	1,514,406 178,351	−112,966 + 21,697
Exports.		
Electrical goods and apparatus	1,166,606	+215,744
Machinery ... ... (Including electrical machinery)	4,456,173 578,445	−621,400 − 84,994
Re-exports.		
Electrical goods and apparatus	38,995	+ 27,983
Machinery ... ... (Including electrical machinery)	138,373 8,083	+ 14,684 − 883

Bankruptcy Proceedings.

E. J. HUTCHINGS WYLIE, 1,367, London Road, Norbury, Surrey, radio set manufacturer.—The receiving order herein was made on January 13th on the debtor's own petition. The statement of affairs shows liabilities of £742 and assets of £14, leaving a deficiency of £728. Debtor attributes his failure to lack of capital and bad trade. He states that in May, 1928, he and another commenced business in partnership as radio set manufacturers, his partner providing £100 as capital. In June, 1928, they supplied a quantity of sets to a customer, who afterwards returned them on the grounds that they were not up to specification. Costly experiments were afterwards made to produce a set to the required standard but without success, and the debtor estimates that they incurred a loss of £300 over this order. In April, 1929, the partnership was dissolved, his partner taking over the assets, about £450, and agreeing to discharge the liabilities of £750. Since June last the debtor has been employed as manager to a firm of wireless set manufacturers. A judgment had been obtained against him by one of the late partnership creditors. At the first meeting of creditors the matter was left in the hands of the Official Receiver as trustee. The following are creditors:—

	£		£
Hughes & Co., T. A. Six-Sixty Radio Co. ...	580 81	London Radio Manufacturing Co., Ltd. ...	80

E. J. LANCELOT, dealer in electric batteries, Old Trinity House, Water Lane, E.C.—The public examination of this debtor was held on February 14th at the London Bankruptcy Court, before Mr. Registrar Mellor, the accounts showing liabilities of £192 against assets of £40. The debtor attributed his insolvency to his liability under a Court judgment. The examination was concluded.

F. W. C. HOEY, wireless and electrical dealer, 29, Sicilian Avenue, W.C.—Trustee, Mr. F. F. Sharles, Salisbury House, E.C., appointed February 5th.

E. E. PEACE (Peace & Co.), manufacturing electrical engineer, rear of 230, High Street, Erdington, Birmingham.—Last day for proofs for dividend February 28th. Trustee, Mr.

C. Hoult, Official Receiver, 191, Corporation Street, Birmingham.

R. R. WRIGHT (Wright Bros.), wireless dealer, 36, Normanton Road, Derby.—First and final dividend of 5s. 7d. in the £, payable February 21st at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham.

R. J. IRVING, trading as R. Irving, 4, Bridge Road, Kirkstall, Leeds, wireless dealer.—A deficiency of £147 was shown in the statement of affairs of this debtor when he attended, on February 11th, for his public examination at the County Court House, Albion Place, Leeds.

J. H. B. TATTERSALL (H. Tattersall), plumber and electrician, 456, Burnley Road, Scout Bottom, Waterfoot, Lancs.—First and final dividend of 5½d. in the £, payable at the Official Receiver's offices, Byrom Street, Manchester.

H. G. EDGHILL, electrical and wireless engineer, 13, Wembley Hill Road, Wembley.—Receiving order made February 10th on debtor's own petition.

C. B. MARSDEN, electrical engineer, rear of 60, Pisgah Street, Kenfig Hill, Glamorgan.—Trustee, Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff, released February 3rd.

E. R. MILLWARD (West of England Radio), wireless engineer, 67, High Street, Barnstaple.—First and final dividend of 2s. 3d. in the £, payable at the Official Receiver's offices, Exeter Bank Chambers, Broadgate, Exeter.

Private Arrangements.

C. H. TAYLOR, 15, Baker Street, Brighton, electrical engineer, &c.—The creditors interested herein met on February 7th at the offices of Mr. A. E. Orbell, 6/7, Old Steine, Brighton. The statement of affairs showed liabilities of £350, all due to the trade, and assets of £45, leaving a deficiency of £305. Mr. Orbell reported that the debtor started trading on his own account as an electrical engineer some three years ago, with a capital of £25, at his parents' house. In June last year he took a shop, but there had been a loss from the commencement. It was decided that the assets should be realised by Mr. Orbell. The following are creditors:—

	£		£
Edison Swan Electric Co., Ltd.	21	Lambert Laws, Ltd. ...	81
Lugton & Co., Ltd. ...	27	Falk, Stadelmann & Co., Ltd.	64

Company Liquidations.

ALDERLEY & WILMSLOW ELECTRIC SUPPLY, LTD.—Particulars of claims by March 3rd to the liquidator, Mr. H. Fraser, 4, Fenchurch Avenue, E.C.

RADIELLE CO., LTD.—Particulars of claims by March 14th to the liquidator, Mr. F. J. Parsons, Austin Friars House, Austin Friars, E.C.

PYE (RADIO), LTD.—A meeting of members is called for March 17th at the offices of Messrs. Bartlett & Gluckstein, 199, Piccadilly, W., to hear an account of the winding up from the liquidator, Mr. W. J. Lovell.

HELIKON WIRELESS CO., LTD.—Liquidator, Mr. T. Gourlay, 29, Russell Square, W.C., released February 6th.

Winding-up Petition.

"PHANTESTRA" (RENNS GRAMOPHONE & WIRELESS), LTD.—A petition has been presented to the High Court for the winding up of the above-named company by Mr. W. W. Levene (Commercial Veneer & Plywood Co.), 6, Bethnal Green Road, E., and will be heard in London on February 24th.

New Catalogues and Lists.

Messrs. S. G. LEACH & Co., LTD.—Price list No. N.S.112, drawing attention to "Standard" electric bell ringing transformers.

CROMPTON PARKINSON, LTD., Guiseley, Leeds.—A brochure illustrating transformer installations carried out by the company, and containing a list of some users of the company's transformers.

Mr. THOMAS A. ROSE, 25, Milton Street, E.C.2.—A leaflet giving particulars of the "Ten-in-One" test meter.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Leflet No. 1112, containing illustrated particulars of portable short-wave stations.

FERRANTI, LTD., Hollinwood, Lancs.—A leaflet illustrating the company's a.c. mains receiver.

BROOKHIRST SWITCHGEAR, LTD.—An illustrated booklet entitled "Motor Control Gear Built for Your Machine," indicating the lines upon which the company has co-operated with certain machine manufacturers in providing motor control gear designed and built for specific machines.

HAMWORTHY ENGINEERING CO., LTD., Poole, Dorset.—Illustrated list No. 823 of small ball-bearing paraffin oil engines. Priced.

MESSRS. W. CHRISTIE & GREY, LTD., 4, Lloyds Avenue, E.C.3.—A leaflet describing the company's methods for preventing vibration and noise caused by machinery.

HIGGS MOTORS, Witton, Birmingham.—A stock list for February of a.c. and d.c. motors.

MESSRS. SYKES & DYSON, LTD., Queen's Mill Road, Huddersfield.—An illustrated catalogue dealing with "Saco" pillars and disconnecting boxes.

A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, S.W.1.—A London stock list of a.c. and d.c. motors, "Furniculus" fires and other domestic appliances.

Messrs. S. G. BROWN, LTD., Western Avenue, North Acton, W.3.—The "Brown Budget" for February contains, in addition to notes on the company's activities, an interesting article on a sales plan for the small town dealer, hints about shop fronts, &c.

Messrs. G. & J. WEIR, LTD., Cathcart, Glasgow.—An illustrated catalogue describing the company's turbo-feed, turbo-electric, and 'Electrofeeder" pumps. Also a booklet entitled "Reducing the Running Costs of Your Plant," which is an abridged summary of the company's standard catalogues of auxiliary machinery.

ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107/111, New Oxford Street, W.C.1.—Illustrated price list No. M.18, dealing with "Elin" d.c. and a.c. motors.

Mr. GEORGE HUMPHREY, 25b, High Street, Wimbledon, S.W.19.—An illustrated and priced leaflet drawing attention to the "Andy" fuse wire carrier.

SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham.—A leaflet advertising Simplex unit panels.

PULLARS' ELECTRIC CO. (BRIGHTON), LTD., 55a, Hollingbury Road, Brighton.—A sheet illustrating in colour some of the company's panel lighting fittings.

STURGE & BAKER, LTD., Sheepcote Street, Birmingham.—List No. 7 containing illustrated particulars and prices of cord absorbers, flex-winders and extension sets.

LONDON ELECTRIC FIRM, Brighton Road, South Croydon.—A sheet containing illustrations of some street lighting installations carried out by the company.

CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester.—An illustrated leaflet describing the "Lane" respirator.

EARTH CLIP CO., 71, Hatherley Street, Princes Park, Liverpool.—A leaflet giving particulars of the "Tecol" earthing clip.

Book Notices.

"The 1930 Practical Electricinn's Pocket Book." Pp. 616; illustrated. London: Odhams Press, Ltd. Price 2s. 6d. net.—This year this book makes its thirty-second appearance, and contains several new sections. "Testing and Fault Localisation," compiled by G. W. Stubbings, B.Sc., is a valuable reference section and is concise and clearly illustrated. Amongst the other new sections are "Induction Motors—Synchronous and Asynchronous," and "Law of Contracts." The new scheme adopted last year for central station data enabled the information to be brought well up-to-date. This year a further alteration in the method of presenting this information has taken place, and the section has been greatly extended.

We have received from BRITISH INSULATED CABLES, LTD., Prescot, Lancs., a copy of "B.I. Wire Tables." This useful booklet includes tables covering copper wire, steel-cored aluminium conductors, conductors for flexible cords and cables, fuse wires, cotton- and enamel-covered wires, vulcanised rubber cables, &c.

The publication of the "City of Birmingham Handbook, 1929-30," appropriately coincides with the opening of the British Industries Fair, and deals in its 271 pages with the history and civic administration of the City and the development of its various services. From the electrical point of view, the sections dealing with the electricity and transport undertakings are of chief interest, the section devoted to the former containing a description of the development of electricity supply in the City from the commencement in 1882 by a small company to the opening of the first section of the Corporation's Hams Hall station by the Duke of York in November last. The transport service is similarly dealt with. The handbook concludes with a special section for visitors in which information is given regarding the City's chief buildings and other attractions, educational facilities, the British Industries Fair, &c.

"Measuring Diagrams for Finding the Iso-Azimuths for Short and Middle Distances from the Radio Beacon, with Directions for Use."—By Professor W. Immler, Elsfleth L.O. Published by Messrs. M. Krayn Technischer Verlag, G.m.b.H., Berlin. Sole agents for the British Isles, Messrs. Stobart & Son, Cathedral House, 8-11, Paternoster Row, E.C.4.

"Unsolved Problems: National and International." By J. S. Hecht. Pp. x+288. London: Jarrolds, Publishers (London), Ltd. Price 16s.

"Electric System Handbook." By C. H. Sanderson. Pp. xii +1,167. Illustrated. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

"Heavy Loss Analysis." By E. A. Uehling. Pp. viii+241. Illustrated. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d. net.

Annual Report of the Board of Regents of the Smithsonian Institution for 1928. Washington: Government Printing Office.

"Memorials of Galileo Galilei, 1564-1642." By J. J. Fahie. Pp. xxiv+172; plates xlvi. London and Leamington: The Courier Press. Price £1 10s. (Limited edition).

"Quips: An Index for Occasions." By H. Ceal Hunt. Pp. 114. London: Philip Allan & Co., Ltd. Price 1s. 6d. net. A useful volume of classified stories for after-dinner speakers.

Recent Contracts.

Messrs. RICHARDSONS, WESTGARTH CO., LTD., have received an order to supply a further condensing plant for the London Electric Supply Corporation's Deptford West power station. This will be the fifth condensing plant which the company has installed at Deptford and will consist of a 38,000 sq. ft. regenerative type surface condenser designed to operate in conjunction

with a 35,000-kW turbine. The shell will be of mild steel, riveted and electrically welded throughout, while the tubes are to be 1 in. in diameter composed of Admiralty mixture. This order also covers air extractors, circulating water and extraction pumps, &c.

An order has been received by Messrs. JOHNSON & PHILLIPS, LTD., from Bristol Corporation for 11 outdoor weatherproof sheet-steel transformer pillars, each to control a 150-kVA transformer, and to be supplied complete with e.h.p. switchgear and distribution gear for five l.p. circuits.

The ALTON BATTERY CO., LTD., informs us that it supplied the battery equipment for the £6,000,000 hydro-electric scheme recently put into commission at Lochaber for the North British Aluminium Co., Ltd.

Local Exhibition.

BIRSTALL.—An exhibition arranged by Electrical Distribution of Yorkshire, Ltd., was held in the Temperance Hall from February 11th to 15th. The exhibits included an all-electric kitchen and bathroom and displays of apparatus by the following firms: Beatty Bros., Belling & Co., Burnley Components, Ltd., Edison Swan Electric Co., Ltd., Electrolux, Ltd., Ferranti, Ltd., Inventum Electrical Appliances, Jackson Electric Stove Co., Ltd., and Metro-Vick Supplies, Ltd.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Feb. 18th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	8d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	8½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitte Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£162	£2 dec.
	Grade II... ... ... ,, ,,	£115	...
	Grade III ... ... ,, ,,	£65	...
c	Brass (rolled metal 2" to 12" basis) per lb.	10½d.	...
c	,, Tubes (solid drawn) ... ,,	1/0½ to 1/1	...
c	,, Wire, basis ... ... ,,	10½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/3	...
g	,, Bars (best selected) ... per ton	£110	...
g	,, Sheet ... ... ,,	£110	...
g	,, Rod ... ... ,,	£110	...
d	,, (Electrolytic) Bars ... ,,	£84 5s.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£94 5s.	...
d	,, ,, H.C. Wire per lb.	11½d.	...
f	Ebonite Rod... ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	8½d.	8½d inc.
i	Iron, Pig (Cleveland No. 3.) ... per ton	73/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£30	...
g	Lead, English pig ... ... ,,	£23	...
g	Mercury ... ... per bot.	£23 2s. 6d.	...
e	Mica (in original cases) small ... per lb.	6d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/5½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/5½	...
p	,, ,, wire... ... ... ,,	1/6	...
o	Platinum ... ... per oz.	£12	5s. dec.
d	Silicium Bronze Wire ... ... per lb.	1/3	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£174 10s. to £175	£3 5s. dec.
n	Wire, Nos. 1 to 16 ... ... per lb.	3/5	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their letter dated February 15th, Messrs. James Forster and Co. state that a slightly better demand from lead consumers was experienced last week, cable makers particularly effecting purchases on the placing of a Post Office cable order. As the inquiry was for early lead, the Producers' Association took advantage of the demand to raise their price 1s. 3d. per ton for this delivery. This small rise seems quite unjustified, as, although lead is not arriving quite so freely a record quantity was imported last month, and there does not seem any probability of a shortage in the near future. "We can find absolutely nothing in the position to justify the present level, but prices are very closely controlled and the surplus metal arriving is being held off the market in order not to depress the price."

Trade Announcements.

The name of Wright Motors (1929), Ltd., Halifax, has been altered to WRIGHT (ELECTRIC POWER SPECIALITIES), LTD.

Messrs. GEORGE ELLISON, LTD., inform us that as from Monday next, February 24th, the address of their London office will be 131, Victoria Street, S.W.1.

As from to-morrow (Saturday) the London office of Messrs. PARMITER, HOPE & SUGDEN, LTD., will be at 131, Victoria Street, S.W.1.

From Monday next (February 24th) the address of Messrs. NATHAN & ALLEN, LTD., will be 131, Victoria Street, Westminster, S.W.1. The telephone number and telegraphic address will remain the same.

THE HENDERSON WIRELESS & ELECTRICAL SERVICE, Brighton, has been appointed sole agent for Kent, Sussex, Hampshire, and the Isle of Wight, for "Stewart" domestic electrical appliances.

For Sale.

Salford City Council invites offers for the purchase of three Lancashire boilers. Mr. H. J. Shaw will sell by auction on February 26th, at 13, High Holborn, W.C.1, wireless and electrical material. (See our advertisement pages to-day.)

Lighting and Power Notes.

Barnsley.—NEW ELECTRICITY TARIFF.—The Corporation Electricity Committee recommends that a flat rate tariff of ½d. per kWh be offered to consumers of electricity for specific purposes, including commercial baking ovens and central heating by electricity, during off-peak load periods.

Belgian Congo.—HYDRO-ELECTRIC DEVELOPMENT.—The Société Générale des Forces Hydro-électriques du Katanga reports that good progress is being made with the construction of the hydro-electric power station which is being established to utilise the Lufira Falls. The necessary buildings have been erected, and work is now in hand on the erection of three 12,000-kVA turbo-generator sets. The transformer stations are also well in hand, and the erection of a 120,000-V transmission line between the generating station and Panda, a distance of about 44 miles, has been completed.

Carlisle.—MAINS EXTENSIONS.—The Corporation Electricity Committee has instructed the engineer to proceed with extensions to mains, at an estimated cost of £1,565, as part of a scheme involving an expenditure of £13,000 approved by the Unemployment Grants Committee for the purposes of a grant.

CHANGE-OVER.—The Electricity Committee is applying to the Unemployment Grants Committee for a grant in respect of the change-over in certain parts of the city from d.c. to a.c., the estimated cost of the work being £6,500.

Chichester.—SUPPLY EXTENSION SCHEME.—The City Council has instructed the electrical engineer to place before the Commissioners a scheme for extending and developing the electricity undertaking, at a cost not to exceed £70,000.

China.—ELECTRICAL DEVELOPMENT.—According to a recent survey, over 109 generating stations are now in operation in the province of Chekiang, the capital invested in these undertakings being estimated at $5,317,620. The total generating capacity amounts to approximately 15,617 kW, of which 12,437 kW is generated by nine stations.

Continental.—SWEDEN.—The Budget Commission of the Riksdag has recommended the granting of the proposed allowance of Kr. 3,600,000 for the construction of a hydro-electric power station at Vargoen and the enlargement of the Motala and Vaesteraas power stations.—*Reuter's Trade Service* (Stockholm).

FRANCE.—The Société des Forces Motrices de la Vienne is extending its 110,000-V transmission line between Le Taurien and Isle Jourdain as far as Secondigny, a further distance of nearly 60 miles.

GERMANY.—The *Deutsche Bergwerks Zeitung* states that there is a plan to transmit electrical energy obtained from Norwegian streams to Germany *via* Denmark (Zeeland, Fuenen and Jutland). The Siemens-Schuckert works are said to be already working out details of the plan. The supply would be transmitted at a pressure of 300,000 V, and the necessary capital of about 500,000,000 kronen would be obtained by raising a loan in America.—*Reuter's Trade Service* (Dusseldorf).

SWITZERLAND.—The electricity department of Zurich is asking the local municipal authorities to vote a sum of £820,000 for the construction of a new hydro-electric station on the Limmat at Wettingen to provide for the growing demand for electric power in the Zurich district.

Dover.—PROPOSED NEW PLANT.—At a meeting of the Town Council held recently it was decided not to take a supply of electricity in bulk, but to apply to the Electricity Commissioners for sanction to the installation of additional plant at the Corporation's generating station.

Dronfield.—ELECTRICITY SUPPLY AGREEMENT.—The Urban District Council has signed an agreement with the Sheffield Corporation for a supply of electricity to Dronfield, and has rejected an offer made by the Dronfield and District Electric Service, Ltd.

Ealing.—RING-MAIN.—The Town Council has approved a recommendation that, subject to the approval of the Electricity Commissioners, the engineer be instructed to prepare specifications and submit estimates of the cost of laying a 33,000-V ring-main with the necessary switch and control gear from the distributing station to the centre of the area of supply and back to the distribution station, in order to permit the transmission of a three-phase supply and a change-over to three-phase distribution along the route of the proposed main. The main is to be operated at a pressure of 22,000 V until such time as a supply at the higher pressure is available from the undertaking's source of supply.

STREET LIGHTING.—The Council is to change the lighting in North and South Roads from gas to electricity.

Eastbourne.—ELECTRICITY MAINS EXTENSIONS.—The Corporation Electricity Committee has passed preliminary estimates for the extensions required to the distributing system in respect of h.p. and l.p. cables and sub-stations, making a total of £12,047.

East Grinstead.—NEW PLANT.—The Urban District Council has approved the installation of an additional generating set at an estimated cost of £9,240.

East Ham.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to lay cables in various streets at an estimated cost of £4,584. Sanction has been received to the borrowing of £3,308 for mains extensions.

Edinburgh.—ASSISTED WIRING SCHEME.—A proposal is to come before the Corporation that the Electricity Committee should be instructed to consider the preparation of a scheme of assisted wiring.

Hastings.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains, at a cost of £1,100, to supply premises at Sedlescombe.

PUBLIC LIGHTING.—The Committee is to erect additional lamps at a cost of £410.

Japan.—NEW POWER STATION.—The Tobu Power Company is to erect a 8,000-kW steam power station in the neighbourhood of Uyeda-machi, Fukushima-ken.

Leigh (Lancs.).—UNEMPLOYMENT SCHEME.—In order to find work for the unemployed the Corporation Electricity Committee is proposing to carry out a scheme for completing the change-over of the system of supply from d.c. to a.c. The scheme will cost £29,432, and application is to be made for sanction to the borrowing of that amount.

Liverpool.—CABLE EXTENSIONS.—Mains extensions are to be undertaken by the Corporation Tramways and Electric Power and Lighting Committee in the Kirkby, Halewood and Gateacre districts. In Kirkby a cubicle will be provided in the Signal Works Road sub-station and an out-door sub-station in Kirkby Village, the total cost being approximately £4,780. The extension of the h.p. mains to Halewood and Gateacre will cost about £1,650; underground mains £414; a cubicle at Halewood sub-station £150; and an out-door sub-station at Gateacre about £250. Mains are to be extended in the Cable Street district at an approximate cost of £1,180, and a sub-station costing about £2,000 is to be erected.

London.—FULHAM.—The Borough Council Electricity and Lighting Committee recommends the expenditure of £1,8 on mains extensions.

Manchester.—PROGRESS DURING DECEMBER.—During the month of December the Corporation electricity undertaking showed an increase in connections of 3,014 kW, bringing the total up to 404,739 kW. The number of applications received for supply, including additional supplies, amounted to 1,093 and represented a total of 2,717 kW. The number of hired cookers connected increased by 119, making the total number of cookers actually connected 5,893. Applications for the hire of cookers totalled 68. Three new sub-stations were put into commission and additional plant was installed at ten existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 8,941 consumers up to January 17th, and sanction had been given and work was in progress involving 1,314 consumers.

North Wales.—TARIFF REDUCTIONS ANTICIPATED.—Representatives of the North Wales Power Co., Ltd., have met in conference representatives of the various councils which receive a bulk supply from the company, to discuss tariffs. As the result of concessions made by the power company, it is anticipated that some councils will be in a position to supply electrical energy for power and heating at 1d. per kWh.

Portland.—NEW CABLES.—The Urban District Council Electricity Committee has decided to lay cables at a cost of £1,492.

Portsmouth.—STATION "SELECTION."—The Corporation has decided to make representations to the Central Electricity Board with a view to the Portsmouth generating station being included as one of the selected stations under the electricity supply scheme for South-West England and South Wales. In the scheme submitted by the Central Electricity Board, Portsmouth is only named as one of the stations to work under temporary arrangements, but in a report prepared by the engineer, it is pointed out that not only does Portsmouth come second in order of population among the chief towns with municipal undertakings within the area, but the Corporation is responsible at present for the supply of electricity outside its own local government area to a greater population than any of the other municipalities in the list. Assuming that the temporary arrangements came to an end at the beginning of 1937, it is estimated that there would be a direct loss to the Portsmouth undertaking of £8,323 in that and succeeding years, until the capital expenditure on the generating station was repaid, in addition to a loss to the Corporation of about £1,500 in tolls on coal arriving by sea, and a loss in rates amounting to about £5,000.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LONDON.—*South Metropolitan Electric Light & Power Co., Ltd.*—Lighting flat-rate: From 5½d. to 5d. per kWh.

GRANGE-OVER-SANDS.—Lighting: From 1s. to 9d. per kWh. Heating: From 2d. to 1½d. per kWh.

WEST KENT.—*West Kent Electric Co., Ltd.*—Lighting at West Wickham, Hayes, Keston, Orpington, Farnborough, part of Chislehurst, St. Mary Cray, St. Paul's Cray, North Cray, Crayford, and Mottingham: from 8d. to 7d. per kWh.

DERBY.—For tenants of Corporation houses who use electricity for purposes other than lighting, the weekly charge will be reduced from 1s. to 9d. as from April 1st next.

Saltcoats.—STREET LIGHTING.—The Town Council has received a report regarding a scheme for the lighting of the streets by electricity at an estimated cost of £8,000.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised mains extensions costing £9,075.

Spalding.—ADMINISTRATION.—The Urban District Council has decided that as from April 1st next the gas and electricity departments shall be under separate management.

Steyning.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Steyning Electric Light Co., Ltd., to supply electricity in parts of the rural districts of Steyning, West Horsham, and Thakeham.

Stoke-on-Trent.—MAINS EXTENSION.—At a meeting of the Corporation Electricity Committee held recently the engineer reported an application for a supply to the works of Pyrosil, Ltd., in Adelaide Street, Burslem, and an application for additional supply to the Washington works of Macintyre & Co., Ltd., in Waterloo Road, Burslem. It was decided to extend the mains to afford the supplies at a cost of £740. The Committee has also decided to lay a main to the premises of Dalehall Mills, Ltd., at a cost of £600.

Taunton.—NEW CABLES.—Application is to be made for sanction to the borrowing of £15,000 for the re-laying of cables.

FREE WIRING SCHEME.—The Town Council has adopted a scheme for the free wiring of small dwellings, prepayment meters to be fixed and set to provide for an additional charge of 3d. per kWh to cover maintenance of the installation and lamp renewals, the installation to remain the property of the Corporation.

United States.—HYDRO-ELECTRIC DEVELOPMENTS.—According to *Power*, application has been filed with the State Hydraulics office in Olympia on behalf of the City of Tacoma, Wash., contemplating a municipal hydro-electric power development on the upper reaches of the Cowlitz River. This is designed to supplement the city's Lake Cushman and Nisqually River plants now in operation. The scheme includes the diversion of 125 sec.-ft. of water from Clear Fork stream into Packwood Lake in Lewis County by means of a tunnel 10 by 12 ft. in diameter and 5.4 miles long, and the impounding of 65,000 acre-ft. of water in the lake by means of a dam 105 ft. high and 600 ft. long, of rock-fill and concrete-core construction. The cost is estimated at $1,500,000 for the tunnelling and $755,700 for the reservoir. The application further seeks the appropriation of 250 sec.-ft. of water from Lake Creek to be conveyed to the power plant by means of 16,000 ft. of tunnel and 6,000 ft. of pipe line, this work and the generating plant to cost approximately $6,120,000. The Packwood Lake development will have a capacity of 40,000 to 50,000 continuous h.p., with storage sufficient for a complete regulation of the stream.

The Montana Power Co., with headquarters in Butte, expects shortly to have completed its Morony hydro-electric project on the Missouri River, 15 miles below Great Falls, Mont., and 5 miles below its Volta power house. The Morony power plant is the eighth that has been erected by the company on the Missouri River and consists of a 90-ft. concrete dam of the gravity type, which forms a storage reservoir of 2,000 acre-ft. capacity, and a 45,000-kW power house.

DEVELOPMENTS DURING 1929.—During 1929 the New England Power Association had 125 developments under construction, of which 90—involving the expenditure of over $20,000,000—were completed. The construction schemes were spread over the States of New Hampshire, Vermont, Massachusetts, and Rhode Island, and provided continuous employment throughout the year for about 2,750 men. The new 200,000-h.p. hydro-electric development on the Upper Connecticut River at the Lower Fifteen Mile Falls site is expected to be in operation by October 1st next.

Winchester.—LOAN SANCTIONED.—The City Council has received sanction to a loan of £3,780 for the provision of a new feeder main from the power station to the Guildhall.

ELECTRICITY TARIFFS.—The Council has received a letter from the Electricity Commissioners stating that they feel some reluctance in advising the Minister of Transport to entertain an application for an Order authorising a minimum flat rate of 1s. per kWh in the parishes of Twyford and Compton, seeing that the present Order authorised a charge of 9d. per kWh. It was suggested that the Council should not proceed further with the matter at the present time, but should consider the position in the light of actual results from the supply in such parishes. This course is being adopted.

Woodhall Spa.—ELECTRICITY SUPPLY.—The Urban District Council has been informed by Mr. Borlase Matthews of his intention to give a supply of electricity to Woodhall Spa within two years in every road where it is desired. The scheme has been approved by the Council.

Tramway and Railway Notes.

Australia.—NEW SOUTH WALES.—Following the announcement of the Railway Commissioners' decision to amalgamate tramway and railway construction, the Cabinet has decided to prepare a Bill to transfer railway construction from the Railway Commissioners to the Public Works Department. It is understood that if the Bill is passed the services of Dr. J. J. C. Bradfield, the chief manager for Metropolitan railway construction, will again be utilised for railway construction if necessary.

The tramways showed a loss of £250,000 in the first seven months of the financial year, as compared with a small profit in the preceding year, and the loss on the railways for the first seven months was £800,000 as compared with a loss of £700,000. It is expected that the economies in the railway administration will not be felt until next year.—*Reuter* (Sydney).

Continental.—SPAIN.—Work on the Madrid Metropolitan subways, which commenced last April, has proceeded so rapidly that all three tunnels will be available for traffic next summer. Two of the three tunnels forming the new combined railway and subway systems have been finished, and rapid headway is being made on the construction of the joint station in Plaza Cataluña. Two additional stations at Plaza Uruquinaona and Arco de Triunfo, will be erected. The original estimates, calling for an expenditure of 12,000,000 pesetas, will, it is thought, be nearly doubled. The whole of the construction costs will be met by the Compañia del Ferrocarril-del-Norte.—*Reuter's Trade Service* (Madrid).

Dewsbury.—RAILLESS CARS.—The Dewsbury and Ossett Corporations are contemplating the substitution of railless cars for their tramway services running between the two towns.

London.—UNDERGROUND BREAKDOWNS.—Failure of the electricity supply occurred at 7.40 p.m. on February 12th on the Central London Railway between the British Museum and Liverpool Street stations. The defect, which is stated to have been due to some workmen on the surface at the Bank piercing one of the cables, was remedied by 8.44 p.m.

A defect at Kew Gardens sub-station also caused a delay on the Central London Railway of about a quarter of an hour during the morning rush period on February 13th.

Rochdale.—PROPOSED TRAMWAY ABANDONMENT.—The Corporation proposes to introduce a Bill in the present session of Parliament seeking permission to abandon certain tramways and to substitute therefor an omnibus service.

United States.—RAILWAY ELECTRIFICATION.—A survey of railway electrification just completed by the Copper and Brass Research Association shows that 18 railways in the United States, formerly operated by steam only, are now electrically operated on about 4,300 miles of track. In this electrified territory the railways have in service 465 electric locomotives and 2,750 multiple-unit cars for passenger service. Of these cars 2,150 are motor cars and the rest are trailers. In addition to the electrification already completed, six railways have similar work under construction, two have definitely announced further electrification programmes, and six new projects have been tentatively announced. Electrifications now under construction are the Delaware, Lackawanna and Western suburban service at New York involving 150 track miles; the Illinois Central freight service, representing mostly yard track; the New York Central freight service on the west side of Manhattan Island; the Pennsylvania extension of the Philadelphia suburban service; the Reading suburban service at Philadelphia including about 110 miles of track, and the Grand Trunk (Canadian National) suburban service from Detroit to Pontiac. It has been definitely announced that the Illinois Central will complete its electrification of all services within the city limits of Chicago and that the Pennsylvania will proceed toward completion of its electrification between New York and Washington.—*Reuter's Trade Service* (New York).

Telegraph and Telephone Notes.

Brazil.—AUTOMATIC TELEPHONY.—The first automatic telephone exchange of the Companhia Telephonica Brasileira has lately been opened at Rio de Janeiro.

Canada.—RAILWAY TELEGRAPHS.—The improvement and extension of its telegraph system, to cost over £600,000, is being planned by the Canadian Pacific Railway Co.

Imperial Telegraphy.—CABLE FAULT.—It was reported from Australia last week that faults had been discovered in the Imperial cable, which recently resumed traffic. It was therefore necessary to divert all Pacific and United Kingdom traffic to the Eastern routes, as was done on a previous occasion when both the Imperial cables were interrupted owing to an earthquake on the eastern American coast.

Italy.—AUTOMATIC TELEPHONY.—On February 9th an automatic and toll exchange in Pisa was inaugurated and successfully cut over. The exchange is equipped for 1,200 sub-lines and 32 toll lines, and is of the 7 D rotary district system, the first of its kind to be installed in Italy. It is equipped for automatic toll switching and provided with a 50-cycle long-distance dialling system for local and transit toll connections. The exchange is the central exchange of the Pisa district, which includes 10 district rural exchanges to be put into service this year. Pisa is in the fourth zone; the concessionary company being the Societa Telefonica Tirrena from which the order was received by Standard Elettrica Italiana.

Ship-Shore Telephony.—NEW RADIO SERVICE.—The Postmaster-General announces that a ship-shore public radio-telephone service has been made available to vessels on the North American transatlantic route. The Government transmitting station at Rugby and the receiving station at Baldock maintain the service. The White Star Co.'s liner *Majestic* is the first ship to make use of the new service, which will enable passengers to communicate with Great Britain throughout a voyage between Europe and the U.S.A.

Telephone Development Association.—ANNUAL MEETING.—At the fifth annual general meeting of the above-named Association, Sir A. Roger, chairman, outlined the development of the Post Office telephone service. He referred to the Association's views regarding the diversion of the annual surplus to the Treasury, instead of applying it to the expansion of the service, and again urged the appointment of a committee to inquire into the practicability of transferring the administration of the telephone and telegraph services to a public statutory authority, similar to the Central Electricity Board and the B.B.C. The Association would not recommened the restoration of the State service to private ownership.

The Telephone Service.—LONDON PROGRESS.—A statement of progress in the London area prepared for the London Telephone Advisory Committee, shows that during the year 1929 direct exchange lines increased to 384,739, an increase of over 110 per cent. in eight years, and exchanges increased by 7 to 137, including 24 automatic, 109 manual, two toll, one trunk, and one tandem exchanges. There was an increase of 28,756 exchange lines, about 8 per cent., the total being 384,739, in addition to 16,641 private telephones, *i.e.*, not connected to the public exchanges. The total number of telephones (exchange and private) was 661,977, representing an increase of 47,794, or 7.8 per cent.

Some large installations were supplied to commercial concerns; thus, a special private branch exchange, working on the automatic system, was installed at the headquarters of one of the large banks with 500 extensions connecting the various departments, and 65 exchange lines to deal with the incoming and outgoing calls; eight special lines connect the headquarters direct with the more important branches, and a subsidiary private branch exchange was installed at one of the branches for communication with the smaller branches in the west end. The number of private branch exchanges in use was 28,086, of which 27,954 were operated manually, and 132 were automatic.

The growth of traffic on the transatlantic service necessitated the opening of two additional radio channels; there are now four channels, and the service covers the whole 24 hours of each day. The maximum number of calls recorded on any one day during the year was 140, of which 81 were outgoing and 59 incoming from America, but, usually, the number of calls from America exceeded somewhat the number to America. Transatlantic and Continental calls increased by 106,829 to a total of 530,874, and the provision of line and switching facilities for the Continental traffic increased considerably; over 108,000 calls were made during October between London and the Continent.

Some 221 lines to various provincial towns were transferred from the trunk to the toll exchange. The average number of calls of all classes handled in the London trunk exchange daily was 60,050, and about 600 outgoing and 200 incoming "personal" calls are dealt with each day in London. Telephone communication was established with the Isle of Man and a direct route from London to the Isle of Wight was opened. The area served by the toll exchange was extended by the inclusion of towns formerly served by the trunk

exchange. The total exchange now serves the South East portion of England from Aldeburgh to Felixstowe on the east, to Portsmouth and Milford on the South Coast; the northern boundary of the area embraces Diss and Bedford, and the western boundary includes Bicester, Basingstoke, and Southampton. The total traffic dealt with daily in the toll exchange was 122,125 calls, an increase of 27 per cent.

The number of local calls was 647,631,825, an increase of 9.3 per cent.

The operating staff (day and night) employed in the exchanges in the London area was 11,700, an increase of 700; over 800 female and 600 male telephonists were recruited during the year, and as a result of the conversion of exchanges to automatic working it was necessary to train 1,100 members of the day and night staffs in the methods of operating procedure in automatic exchanges. About 8,790 engineering workmen were engaged in the construction and maintenance of plant in the London area.

The number of phonograms received at the central telegraph office was about 2,250,000, an increase of over 10 per cent., and the number of telegrams delivered by telephone amounted to nearly 1,120,000, an increase of about 3.5 per cent. Plans are under consideration for a new and enlarged equipment for the phonogram service.

Within the ten mile radius from Oxford Circus, about 18 per cent. of the whole number of lines is connected to automatic exchanges and approximately one quarter of the total originated calls in the London area are now dealt with wholly, or partially, by automatic equipment. During the year 16 new automatic exchanges were opened, which provide for an equipped capacity of 80,000 lines. Apparatus was being installed in 8 exchanges, which will have a total equipped capacity of 32,500 lines, and equipment specifications had been issued for six exchanges having a combined initial capacity of 31,000 lines, whilst preliminary arrangements were in hand for other exchanges, bringing the total number of automatic exchanges to be constructed in London during the next five years to 47. New buildings were in course of erection for the accommodation of 10 automatic exchanges.

The equipment at 19 of the existing manual exchanges was increased, and 8 new manual exchanges were opened. The aggregate capacity of manual exchanges was thus increased by 13,000 lines, and preparations were being made for extending the manual equipment at 10 exchanges and 7 additional manual exchanges will be opened during 1930.

DUDLEY AUTOMATIC AREA.—As was briefly announced last week, the Dudley telephone area was changed to full automatic working on February 8th. The new automatic exchanges comprised in the area are Dudley (1,300 lines), Brierly Hill (500 lines), Cradley Heath (600 lines), and Stourbridge (1,100). They supersede the old rotary system at Dudley and manual switchboards at each of the other exchanges, and now provide a full automatic service for the area. The new equipment was made and installed by Siemens Brothers & Co., Ltd., and is of their No. 50 non-director type.

Radio Notes.

Canada.—LICENCES.—The increasing use of wireless receiving sets in Canada is shown by a total of 336,972 licences issued for 1930, up to the end of January, by the Canadian Government, an increase of 40,046, as compared with the same date last year.—*Reuter* (Ottawa).

Ceylon.—FINANCIAL RESULTS.—The report of the Colonial auditor on wireless matters in Ceylon for 1927-28, based on figures supplied by the Postmaster-General and corrected up to the end of December 31st, 1928, shows that the revenue included a sum of Rs. 11,450, being the value of 1,145 listeners' licences at Rs. 10 each, while 20 dealers' licences at Rs. 30 each brought in Rs. 600. Customs receipts from wireless goods imported amounted to Rs. 10,609, subscriptions for programmes to Rs. 607, and advertisement in programmes to Rs. 875. On the expenditure side, salaries, wages, and overtime, came to Rs. 11,381, cost of electricity to Rs. 7,844, valve renewals to Rs. 1,392, miscellaneous stores to Rs. 5,008, cost of programmes and distribution to Rs. 715, payments to artists and refreshments to Rs. 6,311, and maintenance charges to Rs. 75. The expenditure side also shows a sum of Rs. 4,909 as administration charges at 15 per cent., Rs. 1,789 being interest on capital at 5 per cent., Rs. 3,578 being depreciation at 10 per cent. on Rs. 35,784. The loss on working for the year amounted to Rs. 18,861, says *World-Radio*, which explains that during the last four years the service has been fostered by the chief engineer of the Telegraph Department and his staff, but they have had to face much indifference, and small funds have been placed at their disposal. The Colombo broadcasting station is still rated at only 1.75 kW. It is permitted to broadcast for only two or three hours a day.

Licences.—STEADY INCREASE.—The Earl of Clarendon, chairman of the B.B.C., who is to become the next Governor-General of South Africa, stated in a recent address that the steady, not spasmodic, growth of receipts indicated that the public enjoyed the B.B.C. programmes. There were now about 3,000,000 listeners, the number of new licences issued during the year ended December 31st, 1929, having been 328,344.

MANCHESTER.—It is reported that as a result of a tour during January of Manchester and district by a Post Office wireless detector van, which locates receiving sets that are operated without licences, over 4,000 new licences were purchased in the district.

New Zealand.—LICENCES.—At the end of 1929 the number of receiving licences in force was 50,157.

Spain.—TENDERS SUSPENDED.—The new Government has suspended the examination of tenders for the establishment of broadcasting stations throughout the country and the supply of radio material. As it was intended to grant a monopoly for those services, the news is of interest to English manufacturers.—*Reuter's* (Madrid).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraph Department. March 11th. Bells and buzzers. (B.X. 6053.)*
March 24th. Dial parts. (B.X. 6047.)* Automatic exchange power boards. (B.X. 6072.)*
March 25th. Cordless switchboards. (B.X. 6071.)*
April 1st. Submarine cable. (B.X. 6070.)*
April 15th. Cord type switchboards. (B.X. 6135.)*
April 29th. Telephone relays. (B.X. 6157.)* P.A.B.X. relay sets. (B.X. 6158.)*
March 10th. State Electricity Commission of Victoria. Two 6,000-kVA, 3-phase transformers with spare coils and bushings. (B.X. 6014.)*

Barrhead.—Town Council. Electric lighting installation for 70 houses. The Town Clerk, Municipal Buildings, Barrhead.

Bedford.—March 10th. Electricity Department. Supplies during the year ending March 31st, 1931, of e.h.p., l.p., and l.p. underground cables, and incandescent electric lamps. (February 14th.)

Belfast.—March 3rd. Electricity Department. Supply of stores for 12 months, commencing April 1st, 1930. (February 14th.)

Blackburn.—March 10th. Electricity Committee. Supply of paper-insulated lead-sheathed cables, rubber-insulated wire, meters, and gasfilled and vacuum lamps for twelve months ending March 31st, 1931. (February 14th.)

Brentford.—February 26th. Union Guardians. Provision of a central switchboard and the laying of mains at the West Middlesex Hospital, Isleworth. (February 7th.)

Bristol.—February 26th. Board of Guardians. Electrical fittings for six months. T. S. Lamb, clerk, St. Peter's Hospital.

Croydon.—February 27th. Electricity Department. Supply of 15,000 tons of coal, to be delivered between April 1st and September 30th, 1930. (See this issue.)

Edinburgh.—March 24th. Corporation. Supply for twelve months from May 16th, 1930, of underground insulated cables, underground conduits, pavement and road box frames and covers, house service fuse boxes and fuse boards, meters, link disconnecting boxes and cable dividing boxes. (February 14th.)

Glasgow.—February 28th. Education Authority. Installation of electric lighting in two schools. Specifications from Education Offices, 129, Bath Street (deposit one guinea).

Halifax.—February 28th. Education Committee. Installation of electric light at Southowram Withinfields Council School. Specification from G. Dodgson, Education Officer, Huddersfield Road, Elland.

March 3rd. Town Council. Electricians' work required in connection with the erection of public conveniences. Specification (deposit £1 1s.) from A. C. Tipple, borough engineer.

Hull.—February 20th. Electricity Department. Supply and erection of one water-cooling tower and two motor-driven vertical spindle drainage pumps, and supply and laying of cast-iron circulating water pipes. (January 31st.)

Harrogate.—March 15th. Electricity Department. Supply of general stores for 12 months commencing May 1st, 1930. (See this issue.)

India.—NEW DELHI.—March 5th. India Stores Department. Battery-charging motor-generator for the Indian Telegraphs Department. (B.X. 6146.)*

Kettering.—March 7th. Electricity Department. Supply and delivery of transformers. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—February 22nd. Supply, delivery, and erection of transformer oil treating plant for 18 transformer stations in the Central England Electricity Scheme. (January 31st.)

March 3rd. Construction of site works, foundation works, and buildings in the area of the South-East England Electricity Scheme. (February 7th.)

HAMMERSMITH.—February 26th. Borough Council. Stores (including electric lighting sundries, cables, joint boxes, &c.) for 12 months. (January 24th.)

BETHNAL GREEN.—February 20th. Borough Council. Electric lighting installations at four blocks of tenement dwellings. (February 7th.)

February 24th. Supply of prepayment meters. (February 14th.)

Leicester.—March 7th. Corporation. Installation and fixing of wiring and fittings for electric lighting, &c., at the Belgrave pumping station. (February 14th.)

Liverpool.—March 12th. Electricity Supply Department. Supply of 5,000-kVA, 12,500-kVA, and 33,000-V step-down transformers and 6,000-V and 33,000-V metal-clad switchgear for sub-stations. (See this issue.)

New Zealand.—WELLINGTON.—Post and Telegraph Department. March 24th. Resistances and reactances. (B.X. 6046.)*

March 5th. V.i.r. wire. (B.X. 6089.)*

April 29th. Public Works Department. One 10,000-kVA synchronous condenser and accessories. (B.X. 6034.)* Single-phase transformers and accessories. (B.X. 6035.)*

May 6th. 750-kVA transformers for Arapuni power scheme. (B.X. 6095.)*

May 13th. 110-kV transformers for Mangahao power scheme. (B.X. 6096.)*

Plymouth.—February 20th. Corporation. Supply of meters, cables (paper insulated), and transformers. (January 31st.)

Prestwich.—March 10th. Urban District Council. Electric lamps required during the year 1930-31. Form of tender, &c., from H. T. Ainsworth, surveyor to U.D.C., Town Hall.

Rhondda.—March 29th. Electricity Department. Supply of a.c. house service meters, cables, joint boxes, compound, cut-outs, &s. (See this issue.)

Salford.—February 20th. Education Committee. Electric lighting installation at Tootal Drive School. Particulars from Secretary for Education, Education Offices, Chapel Street.

South Africa.—JOHANNESBURG.—March 20th. Railways and Harbours. Two 150-kVA motor alternators for Durban. (B.X. 6115.)*

CAPE TOWN.—April 2nd. Electricity Department. Five sets of electrically-driven pumps, with accessories, &c. (A.X. 9096.)*

Southend-on-Sea.—March 3rd. Corporation. Supply of general stores for 12 months, commencing April 1st, 1930. (February 7th.)

Stoke-on-Trent.—March 12th. Electrical Engineer's Department. Supply for twelve months of e.h.p. truck type switch gear and a.c. and d.c. meters. (See this issue.)

Torquay.—March 10th. Electricity Department. Supply, delivery, and erection of one 7,500-kW turbo-alternator and condensing plant. (See this issue.)

Walsall and West Bromwich.—March 6th. Unions Joint Committee. Electrical fittings. Form of tender from A. H. Ward. Clerk to the Committee, 12, Lombard Street, West Bromwich.

Warrington.—March 10th. Electricity Department. Motors and transformers. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Australia.—BRISBANE.—City Council. Recommended:—
Two 825-kVA transformers (£1,172).—Edison Swan Electric Co., Ltd. (British Electric Transformer Co., Ltd.).
MELBOURNE.—State Electricity Commission of Victoria.
Paper insulated cables (£1,720).—British Insulated Cables, Ltd.
—*Tenders.*

Ayr.—Education Committee. Accepted:—
Installing electric light at eight blocks of 23 houses.—Darroch & Espie.

Hertfordshire.—County Agricultural Committee. Accepted:—
Electric lighting and power installation at Oaklands (£375). Messrs. Giffens.

London.—Central Electricity Board. Accepted:—
132-kV transformers for the Mid-East England Electricity Scheme: Ferranti, Ltd.; Fuller Electrical & Manufacturing Co., Ltd.; General Electric Co., Ltd. (the amount of the contracts amount to approximately £150,000).
LONDON, MIDLAND & SCOTTISH RAILWAY.
Supply of electric lamps for 12 months.—Siemens Electric Lamps & Supplies, Ltd.
STOKE NEWINGTON.—Electricity Committee:—
Revised tender for rotary converting plant (£7,173).—General Electric Co., Ltd. Recommended

Lowestoft.—Electricity Committee.
Supply of equipment and erection of h.p. mains in connection with the transmission of current to Kessingland.

W. T. Henley's Telegraph Works Co., Ltd. ...	£9 824
Siemens Bros. & Co., Ltd.	9,809
Johnson & Phillips, Ltd.	9,782
British Insulated Cables, Ltd.	9,788
Standard Telephones & Cables, Ltd. ...	9,715
W. T. Glover & Co., Ltd.	9,657
Pirelli-General Cable Works, Ltd.	9,564
CALLENDER'S CABLE & CONSTRUCTION CO., LTD. (Recommended)	9,399

New Zealand.—AUCKLAND.—Auckland Electric Power Board.
2 tons bus-bar copper (£230).—S. Brown, Ltd.
CHRISTCHURCH.—City Council.
48 protective relays (£426).— A. S. Paterson & Co. (Swedish General Electric Co.).
9,800 yd. h.p. cable (£6,235).—Cory, Wright & Salmon.
Supervisory control gear (£1,701), switchgear and control gear (£6,876), spares (£305).—A. D. Riley & Co.
FRANKLIN.—Electric Power Board.
8 tons wire (£853).— J. Nathan & Co.
OTAGO.—Harbour Board.
Electric cable fittings (£231).—A. & T. Burt, Ltd.
WELLINGTON.—Public Works Department.
Transformers for Waitaki (£11,323).—British General Electric Co., Ltd.
—*Tenders.*

Queenborough.—Town Council. Accepted:—
Overhauling and re-wiring the lighting system at the Town Hall.—W. J. Hounsell.

Swansea.—Electricity Committee. Accepted:—
Switchgear (£1,478). — Metropolitan-Vickers Electrical Co., Ltd.

Forthcoming Events.

British Industries Fair, 1930.—February 17th to 28th. Olympia, London, W, and Castle Bromwich, Birmingham.

British Electrical Development Association.—Friday, February 21st. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. "The Electrical Industry and the Architect." Mr. C. H. Flower.

Diesel Engine Users' Association.—Friday, February 21st. Caxton Hall, S.W. 3.30 p.m. The Report of the Committee on Heavy-Oil Engine Working Costs (1928-29).

Association of Supervising Electrical Engineers.—Saturday, February 22nd. Hotel Cecil. Annual dinner.

Electrical Power Engineers' Association (London Local Technical Group).—Tuesday, February 25th. Junior Institution of Engineers, 39, Victoria Street, S.W. 7.15 p.m. "Changing d.c. Networks to a.c." Mr. A. W. Crompton.

(Manchester Local Technical Group).—Wednesday, February 26th. "Low-Temperature Carbonisation of Coal." Dr. A. T. de Mouilpied.

Institution of Production Engineers (Manchester Section).—Thursday, February 27th. Assembly Room, Blackfriars House, Manchester. 7.30 p.m. "The Work and Scope of the Institution." Mr. R. H. Hutchinson.

Royal Society of Arts.—Tuesday, February 25th, John Street, Adelphi, W.C.2. 4.30 p.m. "Scientific and Industrial Research in the British Empire." By Mr. A. W. Hill, F.R.S.

Overhead Lines Association.—Wednesday, February 26th. Georgian Restaurant, Harrod's, Ltd., Knightsbridge, 8 p.m. Conversazione and Supper Dance.

Faraday House Old Students' Association and Rugby Club. Wednesday, February 26th. Hotel Russell, London, W.C. Supper Dance.

Institution of Welding Engineers.—Thursday, February 27th. Caxton Hall, S.W. 7.45 p.m. "The Training of Operators in the Welding and Cutting Industries." Mr. J. Ryder.

Institution of Electrical Engineers.—Thursday, February 27th. Institution, Savoy Place, W.C.2. 6 p.m. Faraday lecture on "Broadcasting by Electric Waves." Capt. P. P. Eckersley.

(North-Eastern Centre).—Monday, February 24th. Armstrong College, Newcastle-on-Tyne. 7 p.m. Informal discussion.

(North-Midland Centre).—Tuesday, February 25th. Hotel Metropole, Leeds. 7 p.m. "The Breaking Performance of High-Power Switchgear and a new form of Quenched-Arc Switch." Mr. L. C. Grant.

(West Wales (Swansea) Sub-Centre).—Friday, February 28th. "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch." Mr. L. C. Grant.

(North-Western Students' Section).—Tuesday, February 25th. Engineers' Club, Manchester. 7.15 p.m. Smoking concert.

Electrical Association for Women.—Friday, February 28th. 46, Kensington Court. "Tariffs." Mr. L. L. Robinson.

Physical Society.—Friday, February 28th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Birmingham Electric Club.—Friday, February 28th. Grand Hotel, Birmingham. 7 p.m. "Electric Propulsion of Ships." Mr. W. J. Belsey.

Junior Institution of Engineers.—Friday, February 28th. 39, Victoria Street, S.W. 7.30 p.m. "The Design of Dynamos for Automobiles." Mr. J. Rowcroft.

Batti-Wallah's Society.—Thursday, March 6th. Hotel Cecil, Strand, W.C. 12.30 for 1 p.m. Luncheon. Sir Felix Pole will deliver an address.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

NEWALL electrical fittings.

Present address of SERVEL, LTD. (makers of refrigerators).

AMBROID cement.

Present address of British agents for ELTRON immersion heaters.

Revolving stands for shop windows.

GRAETZOR hair dryers (makers or suppliers).

DIAMOND lead anchors.

Index to British Standard Specifications.

The 1930 edition of the Index to British Standard Specifications has just been issued by the British Engineering Standards Association. It is a complete subject index which, in view of the large number (378) of British Standard Specifications now available, some of which include provisions for several articles or materials, will be of much assistance to those purchasing engineering and allied material apparatus and machinery. A numerical list of the specifications is also included. The list, which covers 35 pages, shows the wide range of subjects covered by the British Standard Specifications, and it should be in the hands of all drawing offices and contracts departments of firms throughout the engineering and allied authorities who have found the British Standards of such benefit in the preparation of contracts. Copies of the index are available from the Publications Department, British Engineering Standards Association, 28, Victoria Street, London, S.W.1, price 1s. 2d. post free.

To assist in the wider adoption of the British Standard Specifications, the Association has taken accommodation at the British Industries Fair, Birmingham (Stand 16 G3) where copies will be available.

Notes.

The Illuminating Engineering Society.

The 21st annual dinner of the Illuminating Engineering Society was held at the Princes' Galleries, Piccadilly, London, on February 12th. Dr. J. W. T. Walsh, M.A., D.Sc., M.I.E.E., president of the Society, took the chair, and those present numbered about 150 persons.

The toast of the Illuminating Engineering Society was proposed by Col. Sir THOMAS F. PURVES, O.B.E., president, Institution of Electrical Engineers, who said there was a danger of the I.E.E. adopting a proprietary attitude towards the Society, which was however, also representative of the gas engineers. The Society had now enjoyed 21 years of useful life; it was notable for the high qualities of its papers and discussions; and its work was highly valued by the Department of Scientific and Industrial Research and the British Engineering Standards Association. It was concerned both with highly technical matters and everyday practice.

Dr. WALSH, in responding, announced that the proposal to raise a fund of £250 for providing a fitting memorial for the founder and first honorary secretary of the Society, the late Leon Gaster, had been successful. The membership was now nearly 400. Formalities had been completed with the Board of Trade for the Society to receive a charter of incorporation. There had been during the past year a number of well-attended meetings in the provinces, and it was intended to form local centres in the early future. He paid a tribute to the work of the secretary, Mr. J. S. Dow, who was now likely to be busier than ever in making preparations for the visit in 1931 of the International Commission on Illumination, when it was hoped to set an example to the world in methods of lighting.

Mr. C. C. PATERSON, O.B.E. (past president, I.E.S.), proposing the toast of the guests, welcomed the presence of the ladies, who could be of great assistance to the movement in requiring a high standard of lighting. The Society provided a common meeting ground for electrical and gas engineers, whose respective Institutions were the elder brothers of the Society. He commended the strong interest shown in illuminating questions by the Department of Scientific and Industrial Research.

Dr. F. E. SMITH, C.B., C.B.E., F.R.S. (Secretary of the Department of Scientific and Industrial Research) and Mr. H. E. COPP, M.Inst.C.E. (senior vice-president of the Institution of Gas Engineers) briefly responded on behalf of the guests.

The function terminated in a most enjoyable dance.

E.D.A. Carnival at Newcastle.

One of the merriest Valentine night gatherings in Newcastle-on-Tyne on Friday last was the electrical carnival organised by the North-East Area of the British Electrical Development Association. Nearly 1,000 guests were present, including a number of notable figures in the electrical world. Treasure dances were a novel attraction, while the presence of a mysterious couple, "Miss Eda," the electric girl, and "Major Alec Tricity," described as a real live wire "easy to control" whose chief hobby was "increasing domestic comfort," defied anxious seekers for a long time. More than 50 well-known electrical firms gave 80 prizes, which were presented at midnight by Mrs. R. E. Robson, wife of the chairman of the N.E. Area of the E.D.A. Committee, and included electric heaters, lamps, fires, and irons. Amongst those present were Mr. V. Dale, business manager of the Association, Mr. and Mrs. S. E. Monkhouse, Mr. R. P. Sloan, general manager of Newcastle Electric Supply Co., Ltd., Mr. H. Smith (Edison-Swan), Mr. Page (Siemens), and Mr. Page (B.T.-H.), Miss Nora Balls (Electrical Association for Women), and Mr. Alfred Parkin, Area Controller E.D.A.

Research at Birmingham University.

The Joint Standing Committee for Research at the University of Birmingham, in its eighth annual report to the Council and Senate, states that important work, towards which grants-in-aid were made last year, has been done in the Department of Electrical Engineering on the characteristics of the oscillating electric arc, and the causes of the wear and losses occurring at rubbing contacts on overhead power lines. Other subjects of research included experiments upon heat-accumulation stoves; the design of apparatus for calibrating radio wave meters; and a new energy-meter testing device. The publications embodying research completed in the 1927-28 session were: Professor Cramp and Mr. Harvey on "Note on sheath losses in single-core single-phase cables"; Professor Cramp, "Phase advancers of the Scherbius type"; Mr. Harvey, "Electricity in coal mines," and "The electric driving of mine fans"; Mr. Sims, "The pentode and power amplification"; and "Contribution to discussion on 'The Development of the Oxide-Coated Filament,' by Messrs. Hodgson, Harvey, and Pratt."

Educational.

The annual examinations for a Faraday scholarship of eighty guineas per annum, tenable for two years in college and one year in manufacturing works, and for a Maxwell scholarship of sixty guineas per annum, tenable for two years in college and one year in works, will be held at Faraday House, London, on April 8th, 9th and 10th, 1930.

Ventilation and Work.

The scientific conditions that constitute "stuffiness" of a room are not widely understood. The adverse effects of such an atmosphere on efficiency of work are, however, important, and the causes of stuffiness are discussed in the current number of the *Faraday House Journal*, where it is stated that the most common error is to attribute stuffiness to the oxygen content of the air. Even in the case of great stuffiness the oxygen will drop only from, say, 21 per cent. to 19 per cent., an amount quite insufficient to cause serious difference to oxygenation of the blood in the lung. More reasonable is the supposition that it is the increase in carbon-dioxide that accounts for the difference in the feeling; this is supported by the fact that when the proportion rises to 3 per cent. a marked difference is noted in the breathing, and any exertion becomes an effort. With more than this percentage other symptoms appear.

This explanation is, however, unsatisfactory, as the CO_2 content seldom changes by more than 1 per cent, even in crowded spaces, which by itself would be scarcely perceptible. It is known that if the relative humidity is high great discomfort is noticed, since we are dependent on constant evaporation from the skin for our feeling of well-being, and a high relative humidity interferes with this. Thus, dry heat is more endurable than damp heat.

If a fan be turned on in a stuffy room, immediate relief is noticed without any alteration in the constitution of the air. Arising out of this is a psychological factor that cannot be neglected; a feeling of being shut in, known in its exaggerated form as claustrophobia, will produce all the effects of stuffiness. Tests taken in America showed that in schools ventilated directly by open windows less respiratory affections occurred than in those ventilated by artificial means with air carefully regulated to the correct temperature and humidity.

O.L.A. Supper-Dance.

Readers who contemplate attending the Overhead Lines Association's supper-dance on February 26th are reminded that tickets (12s. 6d. each) should be applied for without delay. The honorary social secretary is Mr. W. F. Andrews, 14, Violet Road, London, E.3.

The Electrical Association for Women.

On February 4th over fifty members of the Electrical Association for Women attended a lecture at the E.L.M.A. Lighting Service Bureau, by Mr. G. S. Francis on "Plastic Lighting and Modern Architecture—Changing Styles in Cities and Homes." By means of slides Mr. Francis was able to illustrate the development of architecture and the part lighting has played in this connection. The work now being done in Germany and France is outstanding in both the commercial and domestic fields, and it was gratifying to see some illustrations of charming "modern" interiors in London.

The annual meeting of the Manchester and Salford District Branch of the Association was held on February 11th; it was announced that the total branch membership had risen to 260. Lady Emmott, J.P., was elected president for the coming year, and the meeting was followed by an interesting address on "Education and Electricity" by Miss Faithfull, C.B.E., M.A., J.P., a former head mistress of the Cheltenham Ladies' College.

St. Mary's Church, Eaton Socon.

We are informed by the Bedfordshire, Cambridgeshire, and Huntingdonshire Electricity Co. that the fire which destroyed St. Mary's Church at Eaton Socon, in Bedfordshire, on February 9th, has been attributed, owing to an inaccurate report in the daily Press, to the electric light installation. A Press report stated that the heating stove was not alight at the time, whereas it has been agreed by the assessors that the stove was the origin of the fire, and had actually been stoked up within half an hour of the outbreak.

South-East England.

The Electricity Commissioners have published a map showing the areas of supply of authorised undertakers in South-East England as at January 31st, 1930. This map should prove useful to authorised undertakers and other bodies and persons interested in the question of electrical development in the portion of the country concerned. If there is a sufficient demand for maps of this character, the Commissioners inform us that they would undertake the preparation and issue of similar maps for other sections of the country. Copies of the map are obtainable from Messrs. Edward Stanford, Ltd., 12-14, Long Acre, W.C.2, price 10s. each, package and postage 9d. extra.

Appointments Vacant.

Draughtsmen for the Automatic Telephone Manufacturing Co., Ltd. Junior engineer for Crewe Corporation. Meter tester and repairer for the Cambridge Electric Supply Co., Ltd. Workshop superintendent for the Telegraph Department of the Ceylon Government. Showroom lady assistant for the Burnley Electricity Department. Electrical engineer for power station for the Calcutta Electric Supply Corporation, Ltd. Accounts clerk for Oswestry Corporation Electricity Department. (See our advertisement pages to-day.)

Totalisator Battery Equipment.

A demonstration was recently carried out on the Thirsk racecourse of the working of the latest all-electric totalisator (see ELECTRICAL REVIEW, February 7th, 1930, p. 268). The batteries used for the totalisator are of the d.p. Kathanode type, each battery consisting of 54 cells having a capacity of 500 Ah. Groups of three cells each are fitted in crates and installed securely on a six-wheel Crossley lorry, so that they can be transferred to the various racing centres. At some of the larger race meetings where more than one indicator is in use, as many as four of these battery lorries are used standing side by side, all discharging in parallel, thus having a total capacity of 2,000 Ah. For power supply there is also a 35-kW generator set mounted on a similar lorry, with an engine directly coupled to the dynamo. A substantial switchboard is mounted on the lorry and fitted with the necessary instruments to control the charge and discharge.

Fatality.

An inquiry was held at Airdrie recently into the death of an iron worker in the Waverley iron works of the Scottish Iron and Steel Co., Ltd. It was stated that deceased had put a piece of leather used for lifting the rough steel billets in a narrow space behind the electric switch box, and that he had been seen putting his right hand up to the switch to turn off the current and his left hand behind the box, as if to take out the piece of leather. When he was withdrawing his left hand he came into contact with a "live" wire and received a shock of 440 V. An open verdict was returned.

Gamewell Fire Alarm System.

The Gamewell fire-alarm system, which has been described in our pages, installed by Standard Telephones and Cables, Limited, for the Hendon Urban Distict Council, was officially inaugurated on February 5th. The system comprises 28 boxes, connected in two separate street circuits, and protects the Mill Hill district, the calls being recorded in the local fire stations and simultaneously in the central station at Hendon, where they are automatically timed and dated. The box mechanisms are of the succession type, giving full succession working under normal line conditions, and, by virtue of the selective earthing mechanism, under broken line conditions also. They are timed to send the calls at quarter-second timing, which enables the longest code to be received in less than five seconds. Whenever a fire alarm is received over the system, call-bells in the firemen's quarters, and lamps both in the fire station and in the firemen's houses are automatically operated continuously for half a minute. Telephone facilities are provided over the same lines as are used for the fire-alarm circuits, without in any way interfering with, or delaying, the alarm bells. Portable hand-microtelephones are supplied, and a telephone call to the fire station can be put through from any box in the system by plugging the microtelephone into the jack provided.

Proposed Engineering Museum at Newcastle-on-Tyne.

A memorandum from the Council of the North-East Coast Institution of Engineers and Shipbuilders has been presented to the Lord Mayor of Newcastle-on-Tyne with a view to the appointment of a representative committee to give early consideration to the establishment of an engineering museum on Tyne-side.

The memorandum refers to the fact that the North-East Coast, which was the birthplace of the locomotive engine, of the incandescent electric lamp, of the "Mauretania," of the steam turbine, of the utilisation of hydraulic power, and of electric power distribution on a large scale, finds itself without a public record of these and other vital steps in the progress of the engineering industries and of modern civilisation.

It is urged that the need is a practical one, since all progress has its route in experience, and to organise the accumulated knowledge of the past is an essential preparation for any step forward in the future. No discovery or invention is an isolated leap, but is only the latest of a long series of steps in an unbroken march of inventions and discoveries. To understand the latest, the preceding steps must be examined and understood; and to effect an advance, it is necessary to know, not only the present position, but the train of discovery leading up to it. It is held that one visible model is worth a library of histories and text-books and a month of explanation. The encouragement it would give to the prospective inventor would also be great.

The prosperity of the engineering or any industries must depend more and more on educating public thought to understand, support and develop them. The public is awake to the universal influence exerted on its everyday life by the development of the engineering industries. Such a museum as is proposed would not have to create a demand; it would be meeting a very large one. The popularity of the Science and Engineering Museum at South Kensington is sufficient warrant of that.

Institution of Electrical Engineers.

PORTRAIT PRESENTATION.—At the ordinary meeting of the Institution, to be held on February 27th, the Hon. Sir Charles A. Parsons, O.M., K.C.B., F.R.S., will present to the Institution an oil painting of Sir Joseph Wilson Swan. The portrait was painted by Mr. W. Paget.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. A. T. BULLEN, mains engineer of the Bedford Corporation Electricity Department, has been appointed chief engineer and manager of the Welwyn Garden City Electric Supply Co., Ltd.

The Hazel Grove and Bramhall Urban Council has granted the electricity manager, Mr. TURNER, who has been ill for some time, six months' leave of absence with salary. A temporary engineer is to be appointed at a salary of £500 per annum.

The officials of the Hereford Corporation gave a complimentary dinner at the Green Dragon Hotel, Hereford, on February 6th to Mr. G. D. COE, the electrical engineer, and Mr. G. H. H. WATSON, his deputy, on the occasion of their leaving the service of the Corporation on being transferred with the electricity undertaking to the Shropshire, Worcestershire and Staffordshire Electric Power Company.

On February 11th, Sir FELIX J. C. POLE, chairman of Associated Electrical Industries, Ltd., gave a dinner party at the Savoy Hotel to Mr. GERARD SWOPE, president of the American General Electric Co., and Mr. H. CLARK MINOR, of New York. The guests included Mr. J. H. Thomas, Lord Privy Seal, Mr. G. Balfour, M.P., Lord Ashfield, Sir Philip Nash, Mr. W. C. Lusk and General the Hon. Sir Herbert Lawrence.

We reported in our last issue that Mr. T. A. G. MARGARY had been appointed borough electrical engineer and manager at Wolverhampton. Mr. Margary was educated at Holt School, Norfolk, and King's College, London, and he received his workshop training with the Oxford Engineering Co. From 1898 to 1913 he held progressive posts in the generating and distributing departments of the Islington borough electricity undertaking, and during the last seven years was mains superintendent. He was with Callender's Cable & Construction Co., Ltd., from 1915 to 1919, having been district engineer for the South-West Midland area, which includes Portsmouth, Southampton and the Isle of Wight. Joining the Electrical Engineers' Corps in 1915, he was transferred to the High

Whitlock [*Wolverhampton.*

Mr. T. A. G. Margary,
the New Borough Electrical Engineer and Manager, Wolverhampton.

Explosives Department of the Ministry of Munitions, first as an engineering chemist and later in the electrical engineering section. During the last year of the war he was chief electrical engineer to the large T.N.T. factory at Craig, Leith. In 1919 he became distribution superintendent of Wolverhampton Corporation Electricity Department, and in this capacity was responsible to the chief engineer and general manager for construction, maintenance and operation of all works dealing with mains, sub-stations, meters, public street lighting, stores and sales departments and showrooms.

In our issue of February 7th we announced that Mr. R. M. LONGMAN had been appointed chief assistant to Mr. S. E. Fedden, engineer of the Mid-East England area of the Central Electricity Board. We now reproduce his portrait. Mr. Longman received his technical training at Finsbury Technical College, where he took the electrical and mechanical engineering courses. From there he went to the Newcastle-

Elliott & Fry [*London.*

Mr. R. M. Longman,
Chief Assistant Engineer, Mid-East England Area.

upon-Tyne Electric Supply Co., where he was engaged in sub-stations and power stations, the Testing Department and the Operation Department. From 1909 to 1921 he was testing and technical engineer to Cleveland and Durham Electric Power, Ltd. During the past 8¼ years he has been technical superintendent to the Yorkshire Electric Power Co., and has taken part in the very considerable extension and development of that company's system.

Mr. F. F. SHARLES has relinquished his appointment as secretary of Aeonic Radio, Ltd.

The Grand Council of the Federation of British Industries has nominated Sir JAMES LITHGOW, Bt., as president-elect, while Sir HUGO HIRST, Bt., and Sir ARTHUR DUCKHAM have been nominated as new vice-presidents.

The Secretary for Mines announces that he has appointed Dr. C. V. DRYSDALE, O.B.E., Director of Scientific Research under the Admiralty, to be a member of the Explosives in Mines Research Committee in the place of Dr. F. E. Smith, F.R.S., who has resigned on his appointment as Secretary to the Department of Scientific and Industrial Research.

The Bedford Corporation Electricity Committee recommends the appointment of Mr. A. A. NIMMO as mains engineer at a salary of £448 per annum.

Mr. J. JONES, of the Melksham branch of the West Wilts Electric Supply Co., has been presented by his colleagues with a Westminster chiming clock on the occasion of his marriage.

In this issue we conclude an article upon the undertaking of the Shropshire, Worcestershire & Staffordshire Electric Power Co., the portrait of whose managing director, Mr. J. T. H. LEGGE, appears herewith. Mr. Legge is a West Country man and was educated at the Merchant Venturers' Technical College (now a part of Bristol University), and he received his early electrical training at the Rugby works of the British Thomson-Houston Co., Ltd. After considerable experience, at home and abroad, of power station and electric traction work, Mr. Legge became chief engineer of the S.W. & S. Power Co. in 1914. In 1927 he was appointed chief engineer and manager, and last year he was made

managing director. He has also served the industry in other ways, having been a member of a number of committees appointed by the Electricity Commissioners; a member of the National Joint Council and Board for the Electricity Supply Industry; and a member of the South-West Midlands Joint Advisory Committee.

Lafayette *[London*

Mr. J. T. H. Legge,

Managing Director of the S.W. & S. Power Co.

Last week Mr. WILLIAM WOOD, electrical engineer for Scotland of the L.N.E. Railway, was elected president of the Institution of Railway Signal Engineers.

Obituary.—Mr. S. W. BAYNES.—Mr. G. C. Lundberg, of Messrs. A. P. Lundberg & Sons, Ltd., writes informing us that the late Mr. Sydney Baynes received his early mechanical training as an apprentice to the late Mr. A. P. Lundberg, founder of the company, who was then in business in Bayswater. Mr. Baynes followed Mr. Lundberg when he accepted service under Col. R. E. Crompton in Chelmsford in 1878.

Mr. A. A. CAMPBELL SWINTON, F.R.S.—It is with deep regret that we learn, at the moment of going to press, that Mr. A. A. Campbell Swinton, F.R.S., M.I.E.E., passed away on Wednesday at his residence in Chester Square, London. Mr. Swinton had not been in the best of health for some time, and a fortnight ago he had a fall which confined him to bed. He was born in 1863. We shall refer to his career in our next issue. A memorial service will be held at St. Michael's Church, Chester Square, to-morrow (Saturday) at 2.30 p.m.

SIR WILLIAM HOY.—The death occurred last week of Sir William Wilson Hoy, who was general manager of the South African Government Railways and Harbours for 17 years. Since 1928 he had been chairman of the Rhodesian Railway Commission. Sir William was born in Kinross, Scotland, in 1868, and commenced his railway career at a very early age. His managership of the South African Railways was characterised by a vigorous forward policy which included important electrification schemes.

Mr. M. B. FIELD.—We deeply regret to record that Mr. Michael Birt Field, O.B.E., M.Inst.C.E., M.I.E.E., managing director of Messrs. Kelvin, Bottomley & Baird, Ltd., navigational and electrical instrument makers, Glasgow, met his death on February 15th from injuries sustained through being knocked down by a taxicab on the previous day in Glasgow. Mr. Field, who was 55 years of age, was born in London, and his first connection with Glasgow was on his appointment to the electrical staff of the Corporation Tramways Department. Afterwards he was with Messrs. Ferranti, and nearly 20 years ago he returned to Glasgow to join the firm named above. He became an Associate of the Institution of Electrical Engineers in 1894, and had been a member since 1901. He contributed important papers to the I.E.E. proceedings and to the pages of the technical Press.

MR. W. WATSON.—The death took place on February 5th, at the age of 69 years, of Mr. William Watson, who was head of the firm of Watson & Sons, electricians, of Birmingham Street, Oldbury.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Porthcawl Electricity Co., Ltd.—Registered as a public company February 8th. Capital, £20,000 in £1 shares. Objects: To carry on the business of an electric light and power company in all its branches. The subscribers (each with 1 share) are: C. S. Crosse, J. S. Mellor, and H. R. Turner, all of Kennans House, Crown Court, Cheapside, E.C.2, solicitors, and four others. The first directors are to be appointed by the subscribers. Registered office: Magnet House, Kingsway, W.C.2.

Aristophone & Perfection Radio, Ltd.—Private company. Registered in Edinburgh on February 6th. Capital, £100 in 2s. shares. Objects: To carry on the business of radio engineers, radio valve and apparatus manufacturers, &c. The subscribers (each with one share) are: A. D. Lumsden and M. S. Brough, 94, Hope Street, Glasgow, clerks. The first directors are not named. Solicitors: Symington & Blair, 94, Hope Street, Glasgow.

Reliable Battery Co., Ltd.—Private company. Registered February 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, and manufacturers, accumulator manufacturers, chargers, repairers and assemblers, makers of and dealers in acids and chemicals, manufacturers of wireless or other telephones and telegraphs, phonographs, dynamos, wireless apparatus, &c. The subscribers (each with one share) are R. P. Bradshaw, accumulator manufacturer, and P. S. Bradshaw, 597, Green Lanes, Harringay, N.8, meat trader. R. P. Bradshaw is permanent governing director, with remuneration as fixed by the company. Solicitors: Kerly, Sons & Karuth, 10 & 11, Austin Friars, E.C.2.

Barkers Wireless, Ltd.—Private company. Registered February 8th. Capital, £500 in £1 shares. Objects: To carry on the business of wireless agents and contractors, &c. The first directors are: M. Davies, 25, Seaforth Road, Westcliff-on-Sea; G. Davies, 29, Gore Road, Victoria Park, E.9, clothing manufacturer. Registered office: Buchanan Buildings, 24, Holborn, E.C.1.

Anglo-American Vulcanized Fibre Co,. Ltd.—Private company. Registered February 12th. Capital, £3,000 in £1 shares (2,900 6 per cent. non-cumulative preference and 100 ordinary). Objects: To carry on business as manufacturers, importers and exporters of, agents for, and dealers in vulcanised fibre and other insulating materials for electrical and other purposes, general engineering supplies, motor accessories, radio supplies and components, &c. The subscribers (each with one share) are: C. W. A. Middleditch, 15, Eastcheap, E.C.3, accountant; R. P. Opass, Coventry House, South Place, E.C.2, accountant. The first directors are to be appointed by the subscribers. Secretary: C. W. A. Middleditch. Registered office: Dundee House, 15, Eastcheap, E.C.3.

Atomlite Signs, Ltd.—Private company. Registered February 14th. Capital, £15,000 in 5s. shares. Objects:—To acquire the trade mark "Atomlite," and to carry on the business of manufacturers of and dealers in gas- or vapour-filled electric discharge vessels for lighting and other purposes, vacuum, light sensitive, thermionic, electronic and magnetic, electromagnetic and mechanical or chemical apparatus, &c. The directors are: J. A. Vielle, 35, Cator Road, Sydenham, S.E.26 (director of Atomlite (Parent Company), Ltd., and other companies); G. R. Dunn, 52, Rodenhurst Road, Clapham Park, S.W.4 (director of Babers, Ltd. (Jersey), and other companies). Qualification: 1,000 shares. Registered office: 2, Dean's Yard, The Sanctuary, Westminster.

Altree, Hullock & Co., Ltd.—Private company. Registered February 14th. Capital, £1,000 in 900 8 per cent. cumulative participating preference shares of £1 each, and 1,000 ordinary shares of 2s. each. Objects:—To carry on the business of electrical engineers, radio manufacturers and distributors, &c. The first directors are: J. P. Altree, 61, Neal Street, W.C.2, sheet metal worker; E. R. Hullock, 44, York Street, Broadstairs, merchant. Registered office: 61, Neal Street, W.C.2.

Bold Electric Clock Co., Ltd.—Private company. Registered February 14th. Capital, £2,000 in £1 shares. Objects:—To acquire from J. Waxman and L. Marder the full sole and exclusive licence of Patent No. 305,327, granted to H. Bold for improvements in electrically-driven timepieces, and to carry on the business of watch and clock makers, &c. The directors are: L. Waxman, "Yarborough House," Smedley Lane, Cheetham, Manchester; L. Marder, 297, Cheetham Hill Road, Manchester; H. Bold, 367, Liverpool Street, Seedley, Salford. Registered office: 12a, Withy Grove, Manchester.

Official Returns of Electrical Companies.

Ripaults, Ltd.—Deposit on January 17th, 1930, of deeds of 1, Kings Road, and factory and yard, 1a, 3, 5, Kings Road, Camden Town, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

H. W. Sullivan, Ltd.—Mortgage debenture charged on the company's undertaking and property, present and future, including uncalled and unpaid capital dated January 30th, 1930, to secure all moneys due or to become due from the company to the National Bank, Ltd.

Westminster Engineering Co., Ltd.—Satisfaction to the extent of £500 on December 3rd, 1929, of second debentures authorised August 29th, 1900, and registered August 11th, 1927.

Power Construction Co., Ltd.—Satisfaction in full on May 25th, 1925, of charge dated October 23rd and registered November 11th, 1924, securing £2,000 and £100 bonus.

T.V.E. (Triplex-Blade Ventilating Engineering) Co., Ltd. E. L. Lee, 25, Victoria Street, Westminster, was appointed receiver on February 1st, 1930, under powers contained in instrument dated September 24th, 1928.

Flinders (Wholesale), Ltd.—Capital, £7,000 in 3,000 convertible 8 per cent. preference and 4,000 ordinary shares of £1 each. Return dated January 13th, 1930. 3,000 preference and 3,000 ordinary shares taken up. £6,000 paid. Mortgages and charges, nil.

F. Malby & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated September 28th, 1929. 475 shares taken up. £350 paid. £125 considered as paid. Mortgages and charges: £2,000.

Direct West India Cable Co., Ltd.—Capital, £200,000 in £1 shares. Return dated December 31st, 1929. All shares taken up. £200,000 paid. Mortgages and charges, nil.

Radiax, Ltd.—F. H. C. Christmas, 46/47, London Wall, E.C.2, ceased to act as receiver and manager on January 27th, 1930.

J. W. Gray & Son, Ltd.—Satisfaction in full on January 30th, 1930, of debentures authorised by resolutions of October 29th and December 27th, 1928, and registered January 2nd, 1929, securing £1,500.

Ridout & Ratcliff, Ltd.—Debenture dated January 27th, 1930, to secure £1,000, charged on land at London and the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

Electric Repeating Gramophones, Ltd.—Debenture dated January 28th, 1930, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: P. Baxter, 1, Western Esplanade, Hove.

Bowers & Barr, Ltd.—Mortgage dated January 21st, 1930, to secure £350, charged on 9, Baker Street, Gorleston-on-Sea. Holder: Mrs. S. A. R. Barr, 11, Trafalgar Road, Great Yarmouth.

McGoff & Vickers, Ltd.—Capital, £2,000 in £1 shares. Return dated November 18th, 1929. 1,600 shares taken up. £1,600 paid. Mortgages and charges, nil.

Phœnix Dynamo Manufacturing Co., Ltd.—Capital, £100 in £1 shares. Return dated November 14th, 1929. Two shares taken up. £2 paid. Mortgages and charges, nil.

Ferranti, Ltd.—Capital, £300,000 in 100,000 6 per cent. cumulative preference, 100,000 7 per cent. non-cumulative second preference, and 100,000 ordinary shares of £1 each. Return dated December 5th, 1929. 71,166 6 per cent. cumulative preference, 75,000 7 per cent. non-cumulative second preference, and 100,000 ordinary shares taken up. £246,166 considered as paid. Mortgages and charges, nil.

Tubes, Ltd.—Capital, £215,000 in £1 shares. Return dated November 7th, 1929. All shares taken up. £107,584 paid (being £1 per share on 82,859 and 10s. per share on 49,450 shares). £107,416 considered as paid (being £1 per share on 82,691 and 10s. per share on 49,450 shares). Mortgages and charges, nil.

Radio Improvement Co., Ltd.—Particulars filed of £250 debentures authorised February 6th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £100.

City Notes.

Metropolitan Railway Co.

The report for the year ended December 31st last shows gross receipts of £1,627,470, as compared with £1,610,135 in 1928. The expenditure decreased from £1,118,198 to £1,071,518, and there was therefore an increase in the net revenue from £491,937 to £555,952. After crediting revenue from jointly-owned lines, &c., and deducting miscellaneous charges, the net revenue was £844,515, against £780,612, to which is added a balance brought forward of £23,888, and sundry special additions of £1,013, making £869,416. Debenture interest and preference dividends are paid and a final dividend of £2 15s. per cent. is recommended on the ordinary stock, making £4 per cent. for the year (against £3 10s. per cent. for 1928). The general reserve again receives £10,000, and a balance of £32,016 (against £23,888) is carried forward. The surplus Lands Stock dividend is raised from £3 15s. to £3 17s. 6d. per cent. Passenger traffic to and from the outer suburban areas has continued to expand, and building in the districts served by the company's country lines is still increasing. The construction of Swiss Cottage station has been completed and the rebuilding of Great Portland Street station is nearly finished. Plans are in preparation for the rebuilding of Euston Square station and for certain improvements at Paker Street. Under the Development (Loan Guarantees and Grants) Act, H.M. Treasury has agreed to a grant to enable the company to carry out immediately a scheme of automatic signalling for the line between Rayner's Lane and Uxbridge. After the ordinary meeting yesterday (Thursday) the proprietors were to be asked to approve the company's Bill now before Parliament. This provides for the construction of a branch line from Wembley to Stanmore, &c. The report records the retirement from the Board through ill-health of Sir Harry C. W. Verney, Bart. The vacancy caused has been filled by the appointment of Sir Edmund Wyldbore-Smith.

North Metropolitan Electric Power Supply Co.

The report for the year ended December 31st last shows a net revenue of £400,225, as compared with £374,621 in the preceding year, to which is added £28,202 brought forward, making £428,427. After meeting debenture charges, &c., transferring £126,548 to reserve, and paying the preference dividends, a total dividend of 10 per cent. for the year is paid on the ordinary shares, leaving £28,146 to be carried forward. The capital expenditure during the year amounted to £545,870. Approximately 181 miles of underground and 23 miles of overhead trunk and distributing mains were laid or erected, making the total length 1,498 miles. The number of sub-stations was increased by 50 to 361, and at the Willesden power station a 3,000-kW turbo-alternator was replaced by one of 12,500 kW. The electrical energy sold increased from 164,300,000 to 199,700,000 kWh, and the number of consumers supplied either directly or indirectly by the company, from 99,300 to 117,500. The supply of electricity was extended during the year to several rural districts, and a bulk supply was commenced to the Bishops Stortford, Harlow & Epping Gas & Electricity Co. A change-over from d.c. to a.c. was completed in Hertford, Stevenage, and St. Albans, and reductions in the rates of charge were made in certain districts. To supplement the output from the Willesden station a temporary supply of electricity has been arranged with the Central Electricity Board. Sir Alexander Roger resigned from the board and Lord Ashfield was appointed to fill the vacancy. Sir James Devonshire resigned his position as chairman and managing director (a position which he had held for 25 years), and Lord Ashfield was elected to the position in his stead. Sir James Devonshire was appointed deputy chairman. Meeting: February 25th.

Yorkshire Electric Power Co.

The annual meeting of this company was held on February 19th, Mr. G. F. Peake (deputy chairman) presiding. In presenting the report and accounts, Mr. Peake said that during the year £301,833 was spent on buildings, mains, and other works for development purposes. The new works included 33,000-V overhead lines from Austerfield to Gainsborough, Barugh to Hope, Ferrybridge to Thornhill, Salterhebble to Hebden Bridge, and Shipley to Silsden. There was very little improvement in the demand from the textile industry, but the collieries had made an increased demand. There had also been a substantial increase of sales in bulk to the Distribution Company and to other undertakers and to general power users. Bulk supplies were being given to local authorities and companies, including the Electrical Distribution of Yorkshire, Ltd., for eight boroughs, 93 urban districts, and 20 rural districts,

the majority of which were taking the whole of their supply from the company. During the year authority was received to supply electricity in an area of 66 sq. miles in the County of Derby, and application was being made for powers to supply in the County of Lincoln and in the East Riding. In connection with the Mid-East England Electricity Scheme, the company's three stations were included as "selected" stations. It was proposed to make an early extension to the generating plant at Thornhill by the installation of a 27,500-kW turbo-alternator to meet the growing demands. The report and accounts were adopted.

The "Underground" Group.

The companies forming the London Underground ("Common Fund") group have declared dividends as follows:—

Central London Railway Co.—Final dividend of 2½ per cent. on the undivided ordinary stock, making 5 per cent. for the year (as for 1928); final dividend of 2 per cent. on the preferred ordinary stock, making 4 per cent. for the year (as for 1928); dividend of 6 per cent. on the deferred ordinary stock (against 6 per cent. for 1928). The reserve receives £33,000.

London Electric Railway Co.—Final dividend of 2½ per cent. on the consolidated ordinary stock, making 5 per cent. for the year as for 1928; £186,332 to reserve.

Metropolitan District Railway Co.—Final dividend of 2½ per cent. on the ordinary stock, making 5 per cent. for the year (1928 the same). The allocation to reserve is £117,000.

City and South London Railway Co.—Final dividend on the consolidated ordinary stock of 2½ per cent., making 5 per cent. for the year, as compared with 5 per cent. for 1928; £30,000 to reserve.

London and Suburban Traction Co.—The directors state that they are unable to recommend the payment of a dividend on the 5 per cent. cumulative preference shares.

Underground Electric Railways Co., of London, Ltd.—Final dividend of 5 per cent. on the ordinary shares, making 8 per cent. for the year (against 7 per cent. for 1928). The "carry forward" is increased from £262,504 to £265,950.

Power Securities Corporation Ltd.

Presiding at the annual meeting of this company on February 14th, Mr. G. Balfour (chairman), referring to engineering and construction works, said that the large works at Lochaber had been successfully carried out, involving the removal of a million tons of rock in the 15-mile tunnel, the construction of many shafts, dams, and intakes, finished with the blasting out of the end of the tunnel into Loch Treig 100 ft. under water. The work on the Grampian scheme had gone on without a hitch and was well up to time, and he believed that the hydro-electric power plant, equipped with plant of 32,000-kW capacity, would be in operation in the autumn and the supply available over a wide area. In addition, a large amount of miscellaneous plant and transmission lines had been erected during the year. The company had on hand works involving finance and engineering on a satisfactory basis amounting to upwards of £2,000,000 at home and abroad. A contract had been signed with the Madras Government for the handling of a large hydro-electric plant and the construction of over 100 miles of e.h.p. transmission lines. Intimation had been received that the company's tender for a concession for the electricity supply, including a large hydro-electric development, in Tanganyika had been accepted. The report and accounts were adopted.

Westminster Electric Supply Corporation, Ltd.

The accounts for the year ended December 31st last record a net revenue of £161,292, as compared with £157,654 in the preceding year, to which is added £29,022 brought forward, making £190,314 available, as against £193,205. The preference dividend and the standard ordinary dividend (1s. 9.12d. per share) are paid, £29,166 is transferred to special reserve, and £25,574 is carried forward. An employés co-partnership scheme has been inaugurated, as from January 1st, 1929, and the amount to be distributed for the year is £9,803. The number of meters connected rose from 31,294 to 33,423, and the electrical energy sold from 59,854,409 to 71,436,473 kWh. The report records the death Sir H. O. Bax-Ironside, a director. Col. T. W. Pragnell has been appointed to fill the vacancy. Meeting: February 25th.

Barcelona Traction, Light & Power Co.

A meeting has been called in Toronto for March 20th to consider proposals for the reorganisation of the company's capital. It is proposed to convert each $100 7 per cent. non-cumulative participating preference share into six shares of no par value. At the same time the ordinary shares, which have a nominal value of $50, will also be converted, share for share, into shares of no par value. It is proposed to create a further 400,000 shares of no par value. The authorised capital consists of 300,000 preference and 300,000 ordinary, shares of which 251,964 and 287,250, respectively, have been issued. After the conversion and increase there will be 2,198,854 shares of no par value.

Aluminium Corporation, Ltd.

On February 14th the holders of the company's first debentures agreed to a scheme whereby their debentures would be discharged by the payment of 60 per cent. of their value in cash and the allocation of new debentures bearing a higher rate of interest to the extent of 40 per cent. of their holdings. This forms part of the scheme of capital reorganisation which was outlined in our issue of January 31st (p. 220).

Stock Exchange Notices.

Applications have been made to the Committee to allow the following to be officially quoted:—

Keith (James) and Blackman Company.—200,000 ordinary shares of £1 each, fully paid, Nos. 1 to 200,000.

Shropshire Worcestershire and Staffordshire Electric Power Company.—150,000 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 2,150,001 to 2,300 000.

Dealings in the following have been allowed by the Committee under Rule 159:—

Anglo-Portuguese Telephone Company.—7,555 ordinary shares of £1 each, fully paid, Nos. 610,023 to 617,577.

Shropshire, Worcestershire and Staffordshire Electric Power Company.—200,000 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 2,300,001 to 2,500,000.

Fife Tramway, Light and Power Co.

The total profits of this company's subsidiaries, together with interest on investments, for the past year, amounted to £122,219; of this £15,895 was reserved in the accounts of the companies and the balance was paid over to the parent company. After meeting expenses and adding £5,848 brought forward, the balance available is £105,620. The allocations include £7,767 (against £8,000) to reserve. The dividend on the ordinary shares is maintained at 4 per cent., and £25,286 is carried forward. The report refers to the sale of the company's power and lighting business as from July 1st, 1929, and states that arrangements have been made for dealing with omnibus properties and further protecting the tramway undertakings.

Prospectus.

Metropolitan Railway Co.—On Monday last the British Shareholders' Trust, Ltd., offered for sale £2,000,000 of 3½ per cent. "A" debenture stock of the Metropolitan Railway Co., at the price of £65½ per cent. The prospectus stated that the proceeds would be applied partly to the liquidation of an overdraft on the capital account, and partly to the general purposes of the company, including expenditure on new works of extension, interest on which has been guaranteed by the Government under the Development (Loan Guarantees and Grants) Act, 1929. The issue was quickly over-subscribed.

Official Notice Re Companies.

The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

Dorset and Devon Electricity Supply, Ltd.
English Radio Corporation, Ltd.
Pearlotone Amplifier Co., Ltd.
Radio Components, Ltd.
Rose Bros. Electrical Co., Ltd.

Companies Struck off the Register.

The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved:—

Multi Wiring and Instrument Co., Ltd.
S. L. Electrical Co., Ltd.

Mersey Railway Co.

The receipts for the year ended December 31st last totalled £234,064, and the net revenue was £88,317, to which is added £2,487 brought forward, making £90,804. After deducting debenture interest, placing £2,000 to general reserve, and paying the dividend on the 3 per cent. perpetual preference stock, the directors recommend a dividend of 3 per cent. on the consolidated ordinary stock, leaving £3,683 to be carried forward.

Clarke, Chapman & Co., Ltd.

The gross profit for the past year was £93,907, as compared with £82,519 for 1928, and the net profit was £77,185 (against £68,821). It is proposed to pay a final dividend of 8 per cent., making 11 per cent. for the year, as compared with 10 per cent. for 1928. The allocation to reserve is increased from £10,000 to £15,000, and £23,961 is carried forward, against £16,548 brought in.

Metropolitan Electric Cable and Construction Co., Ltd.

The net profit for the year ended December 31st last amounted to £15,921; to this is added £976 brought forward, making £16,897. It is proposed to transfer £5,000 to reserve (against £2,000) and to pay a dividend of 10 per cent. (against 7½ per cent.), free of tax, leaving £897 to be carried forward.

Consolidated Gas, Electric Light and Power of Baltimore.

A dividend of 90 cents per share has been declared on the common stock for the quarter ending March 31st. Stockholders are being given the right to subscribe for one share of new common stock for each ten shares held, at the price of $60 per share.

Charing Cross Electricity Supply Co., Ltd.

The directors have recommended a final dividend on the ordinary shares of the West End undertakings of the company at the rate of 10 1/16d. per share, less tax, which, with the interim dividend already distributed, makes up the standard dividend for the year.

London Electric Supply Corporation, Ltd.

Final dividends are proposed on the preference shares of 3 per cent., making with the interim dividend 6 per cent., less tax at 4s., for 1929, and 5 per cent. on the ordinary shares, making 9 per cent., less tax at 4s., for the year.

Crossley Bros., Ltd.

The report for the past year shows a net profit of £60,340 (against £56,813), to which is added £125,300 brought forward, making £182,113. From this the dividend on the preference shares (7 per cent.) is paid, and the balance of £157,403 is carried forward. The last ordinary dividend was 3 per cent. in respect of 1920.

Brompton & Kensington Electricity Supply Co.

A final dividend has been declared of 10.477d. per share, less tax, which with the interim dividend of 10d. per share, less tax, completes the standard dividend for the year ended December 31st last.

Shropshire, Worcestershire and Staffordshire Electric Power Co.

At an extraordinary meeting on February 14th a resolution was passed providing for the creation of 200,000 new 6 per cent. cumulative preference shares of £1 each.

Chiswick Electricity Supply Corporation, Ltd.

The final dividend on the ordinary shares is 8¾ per cent., maintaining the total for the year at 16 per cent. £16,000 is placed to depreciation reserve and £3,828 is carried forward.

Mather & Platt, Ltd.

A final dividend of 5 per cent., together with a bonus of similar amount, has been declared on the ordinary shares, making 15 per cent. for the year, as for 1928.

Isle of Thanet Electric Supply Co., Ltd.

A dividend of 4 per cent. on the ordinary shares is proposed for the year ended December 31st last, as for the preceding year, and £30,000 is placed to general reserve and depreciation account.

Italian Issue in New York.

It was announced last week that the National City Co., of New York, was offering for subscription 140,000 shares of the Italian Edison General Electric Co.

Aldershot Gas, Water and District Lighting Co.

Last week this company offered for sale, at a minimum price of 93 per cent., £100,000 of 5 per cent. perpetual debenture stock.

Canadian General Electric Co.

A dividend of 1¾ per cent. has been declared on the preference shares for the three months ending March 31st.

Quebec Power Co.

A dividend of $¾ per share has been declared on the common shares for the quarter ending March 31st.

Norwich Electric Tramways Co.

An interim dividend of 2¼ per cent has been declared.

German Companies.

The *I.C. Vogel Wire and Cable Works Co.*, Berlin, states that business pursued a normal course in 1929 and the degree of activity was satisfactory. The net profits were 552,000 marks, as compared with 551,000 marks in 1928, and the dividend on the ordinary capital is maintained at 6 per cent.

The *Poege Electricity Co.*, Chemnitz, reports a loss of 2,300,000 marks for 1929, as against a loss of 897,000 marks in 1928, which was covered out of the reserve fund. It is proposed to reduce the ordinary share capital from 5,700,000 marks to 950,000 marks, and the preference capital from 300,000 to 100,000 marks.

The *Elektro Works Company*, which is owned by the Reich, reports normal progress in 1929 and an increase in the production of energy from 2,009 million kWh in 1928 to 2,332 million kWh last year, while satisfactory returns were yielded by the company's investments. The capacity of the plant installed at the three power stations was raised by 280,000 kW to 730,000 kW last year. The accounts show net profits of 5,730,000 marks, as compared with 5,220,000 marks in 1928, and the dividend remains at 8 per cent.

Swedish Company.

The *Svenska Ackumulator A.B. Jungner* reports an increase in orders and deliveries in 1929. The accounts show a net profit of 792,000 kr. as against 530,000 kr. in 1926, and the dividend on the ordinary shares remains at 12 per cent.

Stocks and Shares.

TUESDAY EVENING.

THE tendency of capital at the present time is to seek the security of first-rate stocks and shares, and to eschew the more perilous, if more alluring, paths of speculation. For this reason, prices of gilt-edged issues are well maintained, notwithstanding the prophecies which have been made as to possible increases in the income-tax and death-duties. The Government's programme with regard to the safeguarding of industries remains so obscure as to lay a decided restraint upon the investment of money in shares of companies likely to be affected by legislation. The announcements already made by the Cabinet as to its intentions in this respect are regarded as likely to prove precursors to a policy that will retain, at all events for the time being, many of the duties in force at present. But the doubts on the subject are sufficiently definite to restrain people from putting money into industrial stocks and shares, more especially in the face of the disappointing character of the Board of Trade returns. The principal item of interest this week in connection with electrical issues is the announcement by the Underground Electric Railways group of its dividends for the final half of 1929. The American Stock Exchange is evidently having a quiet time, and animation in New York has subsided to such an extent that price movements are comparatively narrow, except in a few individual cases.

New Issues.

The Metropolitan Railway has offered during the past few days £2,000,000 of 3½ per cent. "A" debenture stock at 65½. The yield at this price is £5 6s. 10d. per cent. When the stock is fully paid it will rank *pari passu* with that already in existence. The proceeds of the issue are required for, amongst other things, the expenditure upon certain new works of extension, interest on which has been guaranteed by the Government for a term of years. This stock secured a warm reception from the public, and the lists closed well in advance of the advertised time for which they could have remained open. Dealings have started in Halls Telephone Accessories new shares, the price of which began at about 1s. 6d. premium, and hardened, later on, to 2s. 3d. premium.

Tube Dividends.

The Underground Electric Railways of London has declared a dividend, making 8 per cent. for the year on its ordinary shares, which compares with 7 per cent. for the previous twelve months. The balance forward of £266,000 is about £3,500 up. This announcement fulfilled the most optimistic expectations, and the price of the shares strengthened from 23s. to about 1s. more, the rise being lost, however, as quickly as it was gained, the price going back to 23s. on sales by profit-takers. The Income Bonds are a point lower at 108. The District's dividend, making 5 per cent. for the year, the same as that for 1928, had been generally expected. Increased allocations are made to reserve and to the carry-forward. The dividend on London Electric and City & South London ordinary stocks, both making 5 per cent., and on Central London, making 4 per cent., are the same as before, and no changes have occurred in the prices of the stocks. The London General Omnibus dividend of 4½ per cent. free of tax makes 8 per cent. for the year, and the North Metropolitan Electric Power Supply Company announces 6 per cent., making 10 per cent. for the year, both of these being without change. The figures are good in every case, and the batch of announcements must be regarded as very satisfactory.

"General Conditions."

That the Tube declarations should have had no effect upon the market is due to what are called "general conditions." Although the Hatry settlement has been safely surmounted, and is now a thing of the past, the effects of last September's collapse in the group still linger in various different ways. The immediate cause of doubt is, however, the Budget. What the Government is likely to do in order to meet the shortage that at present seems likely to face the Chancellor of the Exchequer at the end of next month is a matter for the liveliest speculation. So far as the Railways are concerned, these have their own peculiar troubles in the projected Coal Mines Bill and the reversion of wages on May 2nd to the scale which prevailed before the last cut was made.

London United Tramways 4 per cent. debenture has been in demand; the price shows a rise of 2 to 52½. On the other hand, London & Suburban Traction preference have reacted to half a guinea.

Cables and Wireless.

The market in Cables & Wireless stocks has steadied to some extent, and the "A" ordinary, around which most of the interest is revolving at the present time, keeps steady at about 64¼. No fresh information has become available with regard to the action of the Post Office in passing over the claims of Cables & Wireless, Ltd., in favour of the American Telephone Company. It appears clear enough that there is some friction between the Post Office and the Imperial and

International Communications Company, and of old the Post Office earned for itself the reputation of preserving a very stiff-necked, not to say intransigeant, attitude in the management of both telegraphy and telephony. Globe Telegraph and Trust shares are flat, having fallen £1 to 22. The shares changed hands at 21¼. The reason is to be found in the weakness of Cables & Wireless stocks, although well-informed opinion has it that the Globe Telegraph & Trust sold the bulk of its Cables & Wireless "B" stock at a price much nearer par than the current quotation and reinvested the money in Cables preference, the price of which has not, of course, suffered to any material extent during the slump in the two other stocks of the Cables Company. Whether this is the case or not, it is impossible to say, but the report sounds at least probable, and, if correct, the fall in Globes would appear to have been overdone. An improvement of ¼ in Anglo-American Telegraph deferred stock to 24½ is the only change in the American group. American Telephone & Telegraph at 240 is 5 points higher. International Telephone & Telegraph dipped to 69; then rallied to 72¼. Canadian Marconis are quoted at 16s. 3d. Automatic Telephones, at 37s. 6d., are the same as they have been for weeks past. The statement prepared for the London Telephone Advisory Board shows that a number of new automatic exchanges were opened in 1929. The proportion of telephones to population, it is interesting to observe, was 1.12 per cent. last year.

Electricity Supply.

The London electricity supply companies continue to announce final dividends for the last half of 1929, which make up the ordinary standard rates. The London Electric Supply Company is paying 9 per cent. for the year. The Charing Cross Electricity Supply announces its regular dividend, in accordance with the London Electricity Act of 1925, on the West-end undertaking of the company. The Westminster Electric Supply Corporation, which had already declared its usual dividend, states in the annual report that the net revenue of the company amounted last year to £161,300, which is about £3,500 more than that of the previous year. The sum of £29,166 is carried to special reserve ordinary shareholder's proportion of consumers' benefit, this being about £500 higher than that earmarked for the same purpose in the previous year. The company increased its units sold by over 19 per cent. Price changes are comparatively few. County of London reacted to 45s., possibly in connection with the marketing of a large line of the new ordinary shares, which proprietors neglected to take up when the offer was made at 36s. last month. It is a curious commentary upon the indifference with which some people treat their investments—this neglect to accept the handsome bonus which the County of London directors offered to shareholders in the shape of new shares at a price substantially below that which ruled in the market for the senior issue. St. James' & Pall Mall are 1s. higher, at 26s. 6d. Amongst provincial undertakings, Scottish Power eased off to 29s., Midland Electric Power are lower at 32s. 6d. Bournemouth & Poole retain their price at 3 1/16. No changes have occurred in Whitehall Electric 7½ per cent. preference, which remain at 24s., the return, it will be noticed, being 6¼ per cent. on the money. Amongst the Colonial shares, Victoria Falls ordinary are 1/16 down at 2 5/16.

Dollar Stocks.

Montreal Light and Power at 140½ are two points lower, and Power Corporation of Canada receded to 78½. Hydro-Electrics have been erratic, the price touching 44 before it reverted to 42½. Brazilian Tractions weakened to 37½. Shawinigans fell 3, to 78. The Barcelona Traction report caused a slight reaction in the price of the shares to 25½, and the company's 7 per cent. participating preference went back to 150. The price of the latter stock is quoted in the Stock Exchange list at 130 to 170, while the last bargain marked in it is at 232½, on July 21st, 1929. The company's 6 per cent. prior lien bonds have been changing hands fairly frequently of late on the basis of 101½, while the 5½ per cent. first mortgage 50-year bonds are quoted at 54½. Consolidated Gas, Electric Light and Power of Baltimore strengthened to 115. In the Mexican stocks, the tendency is towards lower prices, Mexican Light and Power common and preferred both being down, though the company's second preference shares at 2¾ are rather better. Toronto Power 4½ per cent. debenture, which is a sterling stock, rose to 96.

Manufacturing Issues.

Enfield Cables are a strong feature, with a 5s. rise to 4¼. Buyers came in for shares, which proved to be in short supply. Callender's strengthened to 3¾. A rise of 3 points lifted Callender's Share and Investment 5 per cent. debenture to 100¼. General Electrics are dull at 46s. 3d. The iron, steel, and engineering group is quiescent, but Babcocks are 1/16 up, at 61s. 3d. Vickers continue heavy at 7s. 9d. Power Securities preference at 23s. 3d. show a small gain. Amongst miscellaneous movements, Atlas are a shade better at 26s. 6d., the preference being unchanged at 24s. Madras Electric preference receded to 11s. 3d. The rubber share market looks like going better, but public interest in its shares is still of the abstract order.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1927.	1928.	Price Feb. 18 1929.	Rise or fall	Yield p.c.
Bournemouth and Poole	£1	15	15	8/7½	—	4 18 0
Brompton Ordinary	£1	8½	8½	25/6	—	5 9 10
Charing Cross Ordinary	£1	8½	8½	26/-	—	5 7 8
do. do. 4½% Pref.	£1	4½	4½	17/-xd	—	5 6 0
Chelsea	£1	8¾	8¾	25/-	—	5 12 0
City of London	£1	10	10	22/-	—	4 7 6
do. do. 6% Pref.	£1	6	6	22/6	—	5 6 8
Clyde Valley	£1	8	8	35/3	—	4 8 8
County of London	£1	7	10	45/-	—9d.	4 9 0
do. do. 6% Pref.	£1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref.	£1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	£1	11	11	47/-	—	4 13 7
Kensington Ordinary	£1	8	8	26/-	—	5 7 8
Lancs. Light and Power	£1	7½	7½	27/-	—	5 11 1
London Electric	£1	8½	9	36/6	—	5 5 8
Metropolitan	£1	9	9	39/9	—	4 13 0
do. 4½% Pref.	£1	4½	4½	17/-	—	5 6 0
Midland Counties	£1	6½	6½	29/-	—	4 12 10
Mid. Elec. Power	£1	15	8	32/6	—7/8	4 18 6
Newcastle-on-Tyne Ordinary	£1	6	6	23/9	—	5 1 1
do. 7% Pref.	£1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 4
North Met. Elec. 6% Pref.	£1	6	6	23/-	—	5 9 1
St. James' and Pall Mall	£1	8	8	26/6	+1/-	5 5 8
Scottish Power	£1	8	8	29/-	—1/-	5 6 8
South London	£1	8½	8½	26/6	—	5 4 10
Urban Ordinary	£1	7	7	22/6	—	4 5 2
Westminster Ordinary	£1	8½	8½	35/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	£1	8	8	32/6	—	4 18 6

Home Rails.

Central London Ord. Assented	Stock	4	4	73	—	5 11 1
Metropolitan	£1	8	8½	84	—½	6 5 0
do. District	£1	4	5	74½	—	6 15 2
Underground Electric	£1	5	7	29/-	—	6 1 9
do. do. Income	Bonds	6	6	108	—1	5 11 1

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	£1	1¼	1¼	24½	+⅛	6 4 0
Automatic Telephone	£1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½ Pref.	Stock	—	—	96	—	5 14 8
do. A 7½ Ord.	£1	—	—	64½	—	... ...
do. B Ord.	£1	—	—	80½	—	... ...
Globe Tel. and T. Ord.	£10	10	10	22	—1	*4 11 0
do. do. Pref.	£10	6	6	11	—	5 9 1
Great Northern Tel.	£10	20	20	30½	—½	6 11 2
Marconi-Marine	£1	12½	15	9⅞	—	... ...
Oriental Telephone Ord.	£1	12	12	9½	—	*4 5 5

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	£5	5½	5½	8⅛	—	8 19 6
do. do. 2nd Pref.	£5	6	6	8⅛	—	9 16 0
do. do. 5% Deb.	Stock	5	5	73½	—	6 16 1
British Electric Traction Def. Ord.	£1	5	5	152/6	—	... ...
do. do. Pref. Ord.	£1	8	8	124½	—	6 8 6
Brazil Traction	£100	7	8	37½	—1½	5 6 8
Brit. Columbia Elec. Ry. Pcc.	Stock	5	5	90½	—	5 10 6
London & Sub. Trac. 5% Pref.	£1	Nil	Nil	10/6	—1/-	... ...
London United Tram Deb.	Stock	4	4	53½	+2	7 12 4
Mexico Trams. 5% Bonds	—	5	5	65¾	—	7 12 8
Mexican Light Common	£100	Nil	Nil	76½	—1	... ...
do. 7% Pref.	£100	7	7	71¼	—2	9 15 10
do. 1st Bonds	—	5	5	73½	—	6 18 0
Victoria Falls Ord.	£1	15	15	2⅛	—1/16	5 2 0
Yorkshire (West Riding)		Nil	Nil	8/-	—	... —

Manufacturing Companies.

Assoc. Elec. Ord.	£1	8	—	27/6	—	4 7 3
Babcock & Wilcox	£1	12	15	3⅛	+1/16	*4 17 10
British Aluminium Ord.	£1	10	10	4/1/6	—	*4 7 4
British Elec. Transformer Pref.	£1	7	7	10/-	—	... ...
British Insulated Ord.	£1	15	15	9/-	—	8 17 4
Brush Ord.	Stock	10	10	129½	—	7 18 1
Callenders	£1	15	15	3¾	+1/16	4 0 0
do. 6½% Pref.	£1	6½	6½	22/9	—	5 9 5
Crompton Parkinson Ord.	£-	—	80	21/6	+6d.	6 19 6
do. 8% Pref.	£1	8	8	25/-	—	6 8 0
Edison-Swan 1st Pref.	£1	7½	7½	24/3	—	7 1 9
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	£1	7½	5½	15/-	—	7 6 8
Enfield Cable Ord.	£1	20	20	4⅝	+¼	4 2 0
English Electric	£1	Nil	Nil	3/9	—	... ...
do. do. Pref.	£1	8	Nil	7/6	—	... ...
Gen. Elec. Pref.	£1	6½	6½	24/-	—	5 8 4
do. Ord.	£1	10	10	3⅛	—1/16	4 6 7
Henley	£1	25	30	6⅛	—	4 18 8
do. 4½% Pref.	£5	4½	4½	4¼	—	5 6 0
India-Rubber	£1	Nil	Nil	11/3	—	... ...
Johnson & Phillips	£1	10	—	36/3	—	5 10 3
Siemens Ord.	£1	7½	7½	25/-	—	6 0 0
Telegraph Construction	£10	10	10	17	—	*4 9 5

* Dividends paid free of Income Tax.

The British Industries Fair.—II.

Some Notes on the Exhibits, Visits, and Functions at London and Birmingham.

THE vitality of the British Industries Fair has been demonstrated in a remarkable way during the last week or two. The Press and authorities of all descriptions have shown their appreciation of the fact that the Fair is an excellent means of providing the business which British industry badly needs. The Chancellor of the Exchequer, a few days ago, addressed a letter to Chambers of Commerce and other trade organisations throughout the country, pointing out that while the primary object of the Fair is to display British goods to overseas buyers, it is of great importance that home buyers should visit London and Birmingham to make purchases. The Minister of Health has circularised public authorities asking them to consider whether they cannot obtain their requirements from firms exhibiting at the Fair. He suggests that such action on their part would give their ratepayers a good example to follow.

From all accounts it would appear that the Electrical Section at Birmingham is attracting considerable attention, being justly characterised as the most up-to-date part of the exhibition. Special notice is being given to the possibilities of the built-in electric drive for all kinds of machines.

Mr. Walter Barrow, president of the Birmingham Chamber of Commerce, which is responsible for the organisation and control of the Birmingham Section, stated, on the occasion of a preliminary view on Friday last week, that with the current Fair they started a second decade in its history. During the last three years the amount of space taken by firms exhibiting had increased by 50 per cent. on the average, which showed that exhibitors found it paid them to take part in the Fair.

Mr. E. W. Bache (chairman of the Fair Management Committee), speaking of the size of the Fair, pointed out that there were four miles of gangways, and consequently eight miles of "shop windows."

As in previous years, the opening of the Fair was celebrated on Monday evening by a banquet given by the Government at the Mansion House. The importance of the occasion was marked by the presence of the Duke of York, several members of the Government, and practically the whole of the Diplomatic Corps. The Foreign Secretary (Mr. Arthur Henderson) occupied the chair. The principal speech was that of the Duke of York, who pointed out that the Fair was a great co-operative effort by a nation which did not fully appreciate the advantages of co-operation. By this means those who did not possess elaborate sales organisations of their own were able to use one provided by co-operative effort. The Fair was a vast showroom with an area of half-a-million square feet, where over 2,000 exhibitors representing 60 industries displayed their products. By means of extensive and intensive publicity the Fair was made known to great numbers of buyers in overseas countries, and an advance catalogue in nine languages was distributed several weeks before the opening date. But apart from the foreign buyer, an appeal was made to those at home to visit the Fair to obtain their requirements. In addition to the benefits which exhibitors derived from the Fair, there was an incalculable effect upon the volume of our overseas trade. In conclusion, His Royal Highness stressed a "simple truth"—that we lived by selling goods, a large part of them to foreign customers; therefore everyone in industry must make it his or her business to see that nothing was ever done to risk the slightest harm to the export trade of this country.

Whitlock] *[Birmingham.*

The "Electrical Review" Stand (No. 21 F-4) is situated at the end of the Electrical Section, opposite the Royal Room.

Miss Margaret Bondfield, the Minister of Labour, spoke of the sustained interest which the King and Royal Family had shown in the Fair. The Fair was a potent means of bringing trade to the country, and Miss Bondfield urged the authorities to bring the importance of the Fair to the notice of the women who directed an enormous spending power.

Mr. J. C. Nicholson and Mr. G. N. Guest spoke on behalf of the London and Birmingham exhibitors, respectively. Mr. Guest refuted the oft-repeated suggestion that we were behind in our selling methods, and said that our industry was handicapped by other matters when dealing with foreign markets. Mr. Arthur Henderson dealt with the Naval Conference, and pointed out how much unproductive expenditure could be diverted to the needs of industry if that Conference was successful.

The Spanish Ambassador, the High Commissioner for Australia, Mr. G. M. Gillett (Parliamentary Secretary to the D.O.T.), and the Lord Mayor also spoke.

The *personnel* of the Committee which is to investigate the possibility of extending the scope and utility of the Fair was announced by Mr. Gillett this week. The chairman is Viscount Chelmsford and the members are Lord Barnby, Mr. John Beard, Alderman Sir Percival Bower, Sir John Corcoran, Sir Robert Donald, Sir Wiliam J. Larke, Mr. Guy Locock, Sir Sydney Skinner, Sir Gilbert Vyle, and Mr. Robert Waddington.

In conclusion, we will revert to our own stand, an illustration of which appears herewith. Once again, we invite all members of the industry to make use of the Service Department which we have established there.

Some of the Exhibits.

A Second Instalment of Illustrated Notes.

Revo Electric Co., Ltd.

The most interesting exhibit on this stand is a sample electric cooker in which all elements, boiling plates, grill and ovens are of the plug-in pattern. It is believed that this is the first time an electric cooker has been constructed in this way. This has been rendered possible by the evolution of a suitable plug and socket which is not affected by local heat and therefore retains its resilience. Close contact is obtained by the utilisation of a steel ring which encircles the brass socket.

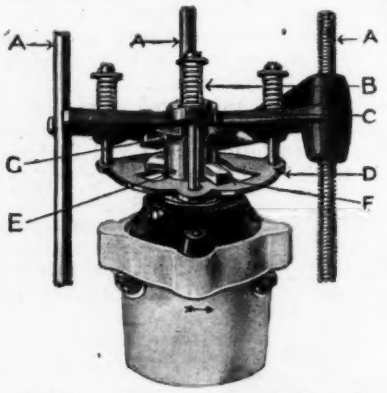

Fig. 17.—A New " Revo " Lampholder Attachment.

The latter is split into four segments whilst the male portion is solid. This system is patented and is also applied to the connectors of all " Revo " irons and kettles. Cookers are exhibited in which top and bottom plug-in elements are employed and alternatively side and bottom. The cookers are finished in a special mottled vitreous enamel, and one is exhibited completely enamelled in a new rainbow vitreous enamel finish. A feature of interest is the adoption of a new switch which has been designed specially for " Revo " cookers. These switches are entirely dustproof, and are so formed as to lie snug behind the vitreous enamelled switch indication plate, but presenting their terminals in such a way in the switchbox as to greatly facilitate wiring and inspection.

Fig. 18.—The " Matchless " Fire.

The well-known " Revo " super-speed boiling plate is being demonstrated.

The company has evolved a novel lampholder attachment (fig. 17). In fittings which are provided with means for adjusting the lamp position, a bridge piece is carried on rods, and to the centre of this bridge piece it has been usual to screw the lampholder, which meant that the wireman, after wiring the lampholder, had to twist the wires so that in screwing the lampholder home they became untwisted. With this new device, however, the lampholder can be instantly released, wired up and fixed in position by a turn of one-sixth of a circle. Briefly, the method of operation is as follows:—To release the lampholder it is pulled down and turned clockwise slightly until the projection " F " on the guide nipple " E " slips through slots in plate " D." In replacing the holder the projection " F " is inserted on the guide nipple " E " in slots in plate " D " and turned clockwise slightly until the projections engage " F " with the cams " G " on the bridge piece " C," locking these into position. The centre contact in the " Revo " Goliath E.S. holder is of the solid sliding stud type which is spring loaded, thus ensuring positive contact.

A range of irons is shown in chromium-plated finish. A large and up-to-date plant for this purpose has been laid down at the company's works. A new fire of elegant design which is shown (fig. 18), is fitted with a very efficient fire bar. This, while it follows the well-known principle of the emitter bar, wherein the element is laid in parabolical troughs, takes a form more suited to the particular application required in the " Matchless " fire. The element, which is split into three sections, is so arranged that an even distribution is obtained over the reflector whichever portion of the element is in operation. Many other devices of interest in the domestic field are on view

Many of the street lighting exhibited are entirely new, and it is demonstrated that these fittings can be ornamental as well as efficient. The refractor band is shown in several new fittings, and a fitting of particular interest is the " Nigerian." This is made entirely of cast iron with a " mirror " finish which is produced by a special vitreous enamel. Cast iron standards and brackets, as well as steel standards, are on view. Special attention is drawn to the new gas-tight fittings suitable for mines, petrol stations, &c. Switch and fuse-gear occupies a part of the stand, and ships' fittings form another exhibit.

A. Reyrolle & Co., Ltd.

Messrs. Reyrolle are showing on behalf of Messrs. J. H. Holmes & Co., Ltd., a " Castle " direct-current electric welding

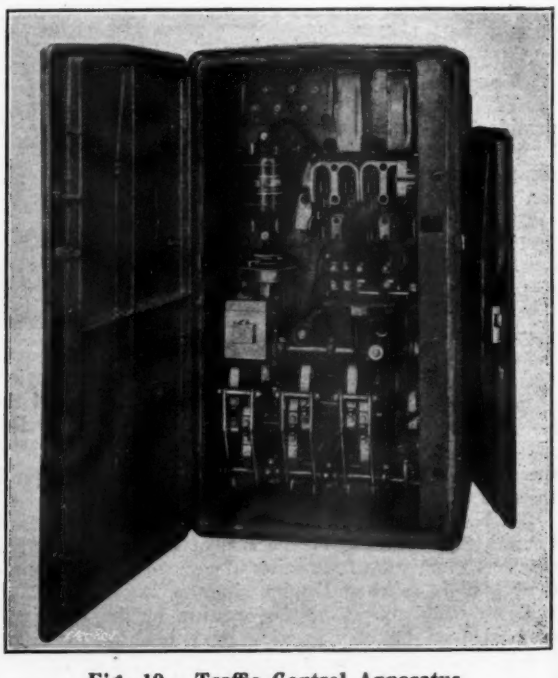

Fig. 19.—Traffic Control Apparatus.

set. The equipment consists of a specially designed and constructed generator, an adjustable choking coil, and a control board, complete with electrode holder, shield, and other accessories. An electric motor drives the generator, but, alternatively, it may be driven by a prime mover, or from a line shaft, and if a direct-current supply is not available for excitation, a small auxiliary generator is provided for this purpose. The essential feature of these equipments is that

they can be set, within the limits of their capacity, for use with any make and size of electrode, and for any thickness of material to be welded. Once the adjustment has been made, the generator will automatically control the voltage and current of the arc in such a way as to afford the greatest possible ease in welding, and will ensure that the arc is struck and maintained at the correct intensity even though the surface to be welded is uneven. No current-limiting devices are necessary or desirable, since the generator is designed to withstand short circuits. The adjustable "choke" prevents the electrode from sticking to the work when contact is first made; its effect is to limit the initial flow of current, and so the operator is able to strike and draw the arc immediately and without any jerk.

The company is also showing, in conjunction with Messrs. J. H. Holmes & Co., Ltd., a set of automatic street traffic control apparatus. The equipment is claimed to comply in detail with the recommendations set out in the memorandum (No. 297) recently issued by the Ministry of Transport. The lamp boxes are of welded sheet-steel construction, and are fitted with either near-side or far-side cast-iron hoods, according to whether the boxes have to be mounted on the near or far side of the crossing. Special diffusing glasses are used, and chromium-plated concave reflectors are mounted behind the signal lamps, which are fitted in an upright position. Each box is capable of rotation about its vertical axis to allow of adjustment on site, and brackets for pole-mounting are available to accommodate the necessary boxes for one-way, two-way, or three-way control. The control apparatus is housed in a cast-iron box (fig. 19), which has two compartments; one contains all the mechanism, including the driving motor, protecting fuses and isolating switch contacts, while the other contains the control handles and levers only. A separate door is fitted to each compartment, so that any adjustment to the timing device can be made in safety by any authorised unskilled person. The door to the main compartment is so interlocked that the isolating switch handle (in the side compartment) must be taken to the "off" position before the door can be opened; all terminals are thus rendered dead before they are exposed. For the convenience of testing, however, the switch is arranged so that it may be re-closed after the door has been opened. The timing device permits of variation of the green signal in both the main and cross street from 5 seconds to 90 seconds in increments of 5 seconds. The amber signal can be initially set for any value between 2 seconds and 10 seconds, and arrangements are made for a trailing red signal whereby the red signal is maintained during the cautionary amber period, prior to the green signal. A self-contained manual control switch is incorporated, and is so interlocked with the motor control switch that the latter must be taken to the "off" position before the hand control switch can be operated. Provision is also made to show a steady amber signal in all directions for night-time working when normal traffic has ceased. A universal motor is utilised to drive the timing mechanism. The contactor switches are suitable for operating up to twelve crossings with single-way boxes, six crossings with two-way boxes, or four with three-way boxes.

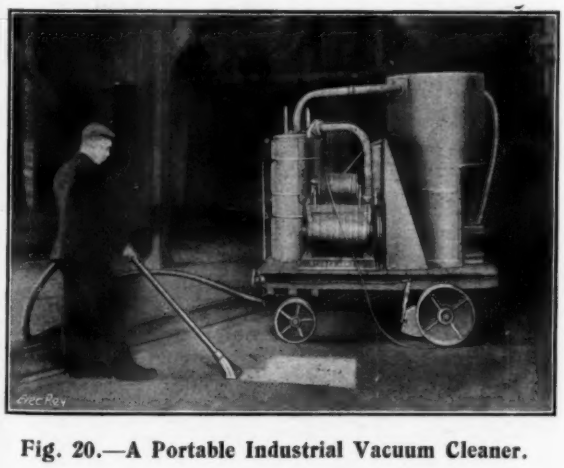

Fig. 20.—A Portable Industrial Vacuum Cleaner.

On the stand of the Electrical Power Engineers' Association, Messrs. Reyrolle exhibit specimen relays used in connection with their ratio-balance feeder-protective system, which was developed specially for protecting sections of the British 132,000-V Grid, where, owing to the long feeder-lines employed, the cost of pilot wires for such protective systems as the Merz-Price would have been excessive. The Reyrolle ratio-balance system is an improvement on what is generally known as the "Impedance" type of protection, and operates on similar principles. It was described in our issue of August 30th last (p. 375). The system is made to depend, not on the impedance but on the reactance between the sub-stations and the fault, and, being thus dependent only upon the length of line, is entirely unaffected by any external variable and uncertain resistances. It has the additional advantage that the relays operate practically instantaneously when a fault occurs within a predetermined distance from the station concerned. A gradually increasing time-delay is introduced outside that distance in order to provide the requisite time-discrimination in the operation of the circuit breakers.

On the stand of the Birmingham Corporation Electricity Department, the company has one of its electrically-heated immersion-type steam raisers. This apparatus is of particular interest in view of the special efforts which are being made to develop domestic and industrial water-heating systems under cheap and advantageous tariffs. The equipment is extremely simple in construction, and it is admirably suited to industrial plants where small quantities of steam are required at intermittent periods, and especially where cleanliness is also an important feature, such as, for example, in a laundry. The sample shown is of 18-kW capacity, and is capable of raising steam in approximately 10 to 15 minutes. The heating elements comprise three 6-kW units, and the required selection is made by means of a standard Reyrolle earthed plug. Three sockets are provided, so arranged that either 1, 2, or 3 units are in circuit.

National Gas Engine Co., Ltd.

Several oil and gas engines are exhibited by this company. Among them is an "NT2" type heavy oil engine, which is

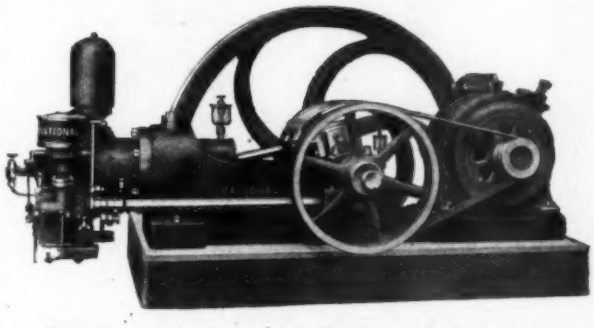

Fig. 21.—A "National" Engine and Generator.

of the horizontal twin-cylinder type, the flywheel being fitted on the outside. It will develop 84 b.h.p. max. and 76 b.h.p. constant at 250 r.p.m. The fuel is delivered by direct mechanical means, through specially constructed atomisers, into the combustion chambers. "National" oil engines are built in standard sizes from 8 to 600 h.p. An "RH" type heavy oil engine is shown. This is a horizontal, single cylinder engine, using cheap oil as fuel. It develops 24 b.h.p. max. and 22 b.h.p. constant at 275 r.p.m. The starting tube is heated by means of a lamp, the time required not exceeding three minutes.

Fig. 21 shows an "MHE" type heavy oil engine and dynamo which form another exhibit. The engine is of similar design to the "RH" type described above, but is fitted with a specially heavy flywheel for dynamo driving. It develops 11 b.h.p. max. and 10 b.h.p. constant at 350 r.p.m. The drive is by means of "Texrope." The "K" type gas engine displayed is a horizontal single-cylinder, 6-b.h.p. engine operating on town's gas. Other exhibits are two "F" type petrol-paraffin engines, one coupled to a dynamo and the other to a compressor.

Sturtevant Engineering Co., Ltd.

A feature of this company's display is a special portable industrial vacuum cleaner (fig. 20) for cleaning boiler houses, gas works, and other places where a large quantity of material is required to be picked up. This machine is fitted with a primary receiver, hoppered at the bottom, so that the material can be sacked off periodically. Any fine dust carried over from the primary receiver is caught in a dust separator with a textile filter screen, and a removable dustbin at its base. The necessary large air volume at the correct vacuum is produced by a multi-stage turbo-exhauster, driven by a 4-h.p. electric motor. Other exhibits include large vacuum cleaning plants, both portable and stationary, for business and industrial buildings, also turbo-blowers and exhausters for supplying clean dry air at suitable pressures or vacua for various purposes. These machines are useful for cleaning electrical equipment. Pneumatic dispatch and cash-tube equipment is also shown, and a central station with the necessary central desk exhibited.

W. & T. Avery, Ltd.

The exhibits of this company include testing machines for carrying out all kinds of physical tests, counting machines for industry, which reduce overhead costs, industrial visible weighers for use in any and every trade where weighing operations take place, automatic weighers for weighing, without attendance, coal, grain, and many kinds of liquids, and other weighing machines. A petrol pump and an instrument for obtaining without calculation the specific gravity of substances, both solid and liquid, are also shown.

Moffats, Ltd.

This company is represented in England by Mr. Alan Williams, 15, Victoria Street, S.W.1, who is displaying the company's cookers on the Canadian Government stand. The exhibits comprise the E30, E36, and E31 models which are of the cabinet or table type with the oven at approximately the same level as the boiling table. These patterns are suitable for use in country houses and town residences where ample space is available and they are representative of a larger series, the biggest of which contains three ovens, two warming compartments, and six boiling plates. Top and bottom heating

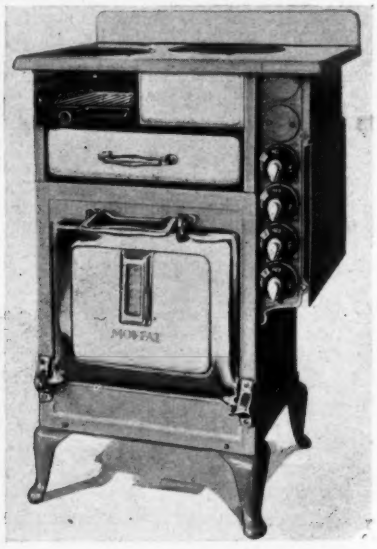

Fig. 22.—A " Moffat " Cooker.

is adopted for the ovens and grilling is done under the upper element in the oven. They are finished in two styles, standard and " C," the latter being an all vitreous enamel finish. A further series of Moffat ranges shown is the E43, E42, and E41. The E43 and E42 have been designed particularly for the English market and are provided with an independent grill. They are of the pedestal type, the E43 having two boiling plates, a combined grill and hotplate and a warming compartment of useful dimensions which is made in the form of a drawer, or alternatively a space with a drop front door. The E42 (fig.22) is a size smaller and a useful range for hiring out or sale to smaller houses. In this range there are two boiling plates, one of which consists of a " Pyroy " double-purpose totally-enclosed element which also acts as a grill. This combination element forms a very economical breakfast cooker. As in the case of the E43 there is a capacious warming compartment or drawer. The ovens follow the company's usual practice having elements top and bottom, the upper one being available for grilling if desired. The E41 is a small cooker for flats, apartments, &c. It is built similarly to the larger ranges, being of solid construction with ample heat insulation. The top and front are in vitreous enamel and the hob is provided with a " Pyroy " element which is a quick boiler. This element also serves as an upper element in the oven and can be used for grilling. All the ovens and boiling plates are controlled by three heat switches giving ample regulation for all purposes.

The " Pyroy " double-purpose element is loaded to 1,500 watts and is totally enclosed in a special alloy casing which may be subjected continuously to high temperature. Examples are also shown of the E38 and E28 ranges. These are also of the pedestal type but without separate grill. The E38 has a very large oven and four boiling plates and is very suitable for large households, while the E28 is of similar design but smaller, corresponding in size to the E42 type. A new design of hob plate has recently been introduced and is on view. It is so arranged that water spilt over from the pans cannot reach any electrical wires or connections, and provides for rapid changing of plates and thoroughly efficient earthing.

The exhibit also includes a water heater which is usually installed in conjunction with a hot water cylinder of large capacity and may be hand or thermostat controlled.

Rawlplug Co., Ltd.

On this stand are shown Rawlplugs in all sizes to take every size of screw, Rawlplug tools, bolt anchors, bathroom fittings in four distinct finishes, " Durium," " Enamulin," vitreous porcelain and stainless chromium, " Durofix," a waterproof adhesive, " Durolustre," a tarnish preventative, plastic wood, wood in putty form, and liquid porcelain, a quick-drying, easy brushing cellulose lacquer. A feature of the stand is a moving exhibit which is designed to show clearly the principle of expansion which is responsible for the success of the Rawlplug method of fixing.

Film Cooling Towers (1925), Ltd.

This company is exhibiting in conjunction with the New Engineering Construction Co., Ltd., a model of a cooling tower built in timber, and of the usual design but with the company's patent irrigation. A working model showing this irrigation is also shown. Another exhibit is a small model of a concrete cooling tower having an irrigation specially designed for large concrete units. The irrigation is so arranged that the cooling air can penetrate to the centre of the tower, this giving an even cooling over the whole ground surface. In addition there is shown a small gallery constructed of open steelwork flooring complete with steps and handrail. This patent flooring is manufactured by the New Engineering Construction Co., Ltd. A number of photographs are exhibited showing complete installations of cooling towers and of steel flooring.

Midland Fan Co., Ltd.

This company's exhibit comprises all kinds of spraying equipment for the application of paints, enamels, varnishes and cellulose material, with working demonstration plant on the stand.

William McGeoch & Co., Ltd.

The exhibits on the stand of this firm include switchboards (battery, regulating, and wireless), all types of switch and fusegear, and unit type ironclad switchgear and boards and patent H.O. type self-aligning fuses. Various types of modern electric light fittings and standards, suitable for ships, railways, public buildings, &c., are also shown, together with lampholders, ships' navigation lamps and indicators, Morse flashing lamps, plugs and sockets, &c. A number of miniature electrical fittings suitable for yachts and motor coaches are on view.

Electric Furnace Co., Ltd.

This company and its newly-formed subsidiary company, The Electrical Resistance Furnace Co., Ltd., deal with electric melting furnaces of all types, such as the Héroult arc furnace, the Ajax-Wyatt induction furnace, the Ajax-Northrup high-frequency furnace, &c. The types of furnace which they construct are generally of far too large a size to show in operation at an exhibition, and consequently their principal furnaces are shown by means of photographs of installations, drawings, &c. They are exhibiting in operation a 35-kVA Ajax-Northrup high-frequency furnace (fig. 23). This unit is suitable for use in laboratories and also illustrates the principle of high frequency melting, which has now been developed to such an extent that furnaces of a capacity of one ton of steel per hour are in operation and furnaces up to five tons' capacity have been designed. A new type of poking machine is also exhibited, which is used for stirring brass swarf in Ajax-Wyatt furnaces. This machine

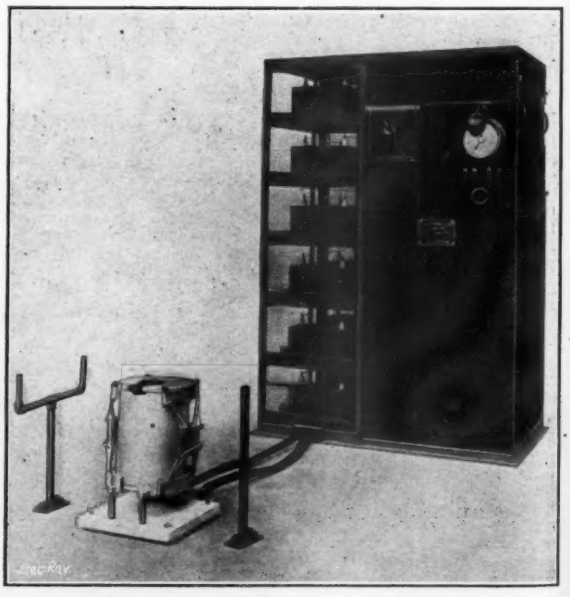

Fig. 23.—A 35-kVA Ajax-Northrup Furnace.

greatly reduces labour costs, reduces the power consumption, and increases the number of heats produced in a given time by over 20 per cent.

Another exhibit is a melting pot heated by electrical resistors, which is suitable for aluminium, lead, and other metals of low melting point. The pot shown has a capacity for about 200 lb. of aluminium. These pots are made in sizes varying from 20 lb. up to 5 tons. An air heater is shown, suitable for supplying hot air for drying purposes of all kinds, such as tea, rubber latex, cores, &c. The heater shown is of very simple construction and of 3.4 kW rating. The display includes a number of electric furnace products.

Micanite and Insulators Co., Ltd.

The main feature of this company's comprehensive display of electrical insulating materials is a complete range of high-voltage condenser-type bushings for outdoor service for use on both transformers and oil circuit-breakers. The exhibit includes typical examples of bushings for various working pressures up to and including 132 kV manufactured by the company for British transformer makers in connection with the national "Grid" scheme. These bushings are provided with facilities for the assembly of current transformers, some of which are shown in position. The accompanying illustration (fig. 24) shows a 132-kV outdoor condenser-type transformer bushing for the Grid scheme, four of which are exhibited on the stand. The display also includes representative examples of the various applications of "Paxolin" varnished paper insulation and micanite, in which the company specialises. A comprehensive range of "Paxolin" boards, from the thin material used for punching, up to heavy panels for control gear, and tubes for all purposes, including formers for wireless applications, are shown, together with samples of mica and micanite used in the manufacture of electrical apparatus.

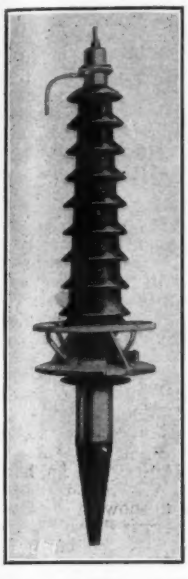

Fig. 24.—A 132-kV "Grid" Transformer Bushing.

Mr. R. M. Catterson-Smith.

Among several small electric furnaces shown on this stand is an automatic twin tube furnace designed for the continuous delivery of billets suitable for hot press work or for annealing. The furnace consists of two heater tubes approximately 22 in. long, wound with nickel chrome wire, and a further portion of about 6 in. heated by non-metallic resistor rods. The whole is encased in a rectangular box and surrounded by insulation brick. A metal push rod actuated from a solenoid by a lever and chain motion forces the billets into the tubes at pre-determined intervals, and they push one another through to the outlet end. A small motor drives a camshaft and tilts a small mercury switch, thus completing the circuit of each solenoid once every revolution. The input to the furnace demonstrated is 3.2 kW. Maintenance of temperature is obtained by an expanding type of cut-out working a clapper switch. A rotary hearth furnace shown consists of a refractory hearth driven by a small electric motor through suitable gearing, and it is suitable for heating metal parts or baking chemicals. The automatic control is similar to that of the twin tube furnace. Another exhibit is a standard furnace for pottery or any work requiring a temperature of 1,300 deg. C. The furnace lining of high-grade sillimanite refractory and the heater rods are placed in recesses in the lining. All heating elements are independent units and may be replaced separately. The speed of heating is controlled by a rheostat. Laboratory furnaces of simple design, wire-wound furnaces for a maximum temperature of 1,000 deg. C. and resistor rod types for temperatures up to 1,300 deg. C. are also on view, as well as refractory linings and insulators, and temperature indicators.

C. H. Parsons, Ltd.

This company is showing the new 15-A quick-make-and-break switch and plug described in our issue of December 13th last. In addition to this there are examples of 15-A surface and flush-type, 15-A quick-make-and-break switches and 5-A models. As usual a large selection of "Britmac" lampholders, switchplates and other accessories is to be seen.

Birmingham Corporation Electricity Department.

This Department is displaying electric power equipment with a range of portable tools, electric paint burners, branding irons, drills, grinders, mops, &c., small electric furnaces and welders, industrial heating apparatus, oven and cooking apparatus suitable for canteens, cafés, &c., water-heating apparatus, and industrial lighting fittings.

Oldham & Son, Ltd.

This company's exhibit is in three parts. In the battery section there are specimens of low-tension accumulators in glass and celluloid including a range of slow-discharge cells with "Laminode" plates; a full range of unspillable accumulators for use with portable radio receivers; air-spaced high-tension accumulators, which can be assembled on the "expanding-bookcase" principle; and samples of portable batteries for car starting and lighting and 'bus lighting. In this section also are shown examples of the company's h.t. and l.t. "Auto-power" units and h.t. battery chargers, all of which are fitted with Westinghouse dry metal rectifiers.

In the mining section there are on view "Oldham" patent electric safety lamps, specially designed for every kind of service underground, together with lamp-room equipment for cleaning, charging, and maintaining an efficient lamp service at the colliery. This section also includes the "Oldham" patent portable brake jig pulley and gas-testing apparatus. There is also a section covering hatting machinery.

F. Gilman (B.S.T.), Ltd.

This company is exhibiting a full range of scaling tools for every type of tube scaling work from ¾ in. condenser tubes upwards, including machines and plant suitable for dealing with evaporators, multi-tubular boilers of the "Yarrow," Clarke-Chapman, Babcock & Wilcox, Stirling and Thompson types, as well as machines for economisers of every make, and special plant for scaling Lancashire boilers. In addition machines are shown for dealing with copper tubes, for cleaning moulds, for fettling and trimming castings, for tank cleaning purposes, for rust and paint removing and other similar work, and for ship work. There is a new electrical plant which can be plugged into an electric light socket. The motor is ¼ h.p. and is mounted on a swivel bracket, allowing both lateral and vertical movement. It is mounted about 3 ft. 6 in. from the ground on a pedestal fitted with castor wheels. Half-way up the pedestal there is a circular tray which is provided for carrying the various working heads when not in use. The drive from the motor is by means of flexible shafting, such as is provided with practically all "Skatoskalo" tools running in a steel reinforced rubber outer covering. Various working heads can be attached to the flexible drive in a very simple way, and the machine will carry out such work as drilling (in the most inaccessible positions) and grinding with emery wheels. It can also be used for sanding car bodies before painting or cellulosing, as well as for polishing and finishing off the paint or cellulose, after it has been applied. There are many other applications. The company also has a similar machine embodying a 1½-h.p. motor.

John Harper & Co., Ltd.

Samples of sandblasted castings as supplied to the electrical industry are displayed on this stand. They include castings of high magnetic permeability and also of "Rapide" iron which the company claims can be machined at a speed 40 per cent. higher than anything which has hitherto been possible. Castings of ¼ in. section and upwards give a deflection test of 1/5 in. on a 12-in. bar.

Davis & Timmins, Ltd.

This exhibit consists of a case showing metal thread screws, bolts, nuts and terminals turned from the solid rod, examples of repetition work in all metals for electrical and general engineering, motor and other trades, and as supplied to the Admiralty, War Office, Post Office and other Government Departments.

Sturge & Baker, Ltd.

As in previous years this company has a varied selection of electrical appliances. Messrs. Sturge & Baker claim to have been pioneers of the electric bowl fire industry, and consequently bowl fires are prominent upon the stand. Among the

Fig. 25.—The "Manor House" Fire.

"Red Rose" fires shown is a 300-W table pattern and also an equipment, in a neat case, combining one of these fires with a small kettle. A new design of fire is the "Manor House," one of which is illustrated in fig. 25. It is equipped with 1,000-W elements of a novel shape mounted in hammered copper reflectors, the latter being set at a slight angle to one another to increase the radius of distribution. The fire is made with two or three elements. The company is again showing its cable absorbers of various patterns, including flex winders, as well as a novel form of bed warmer, in which the electric heater is mounted in a wooden framework enabling the whole of a bed to be heated.

R. A. Lister & Co., Ltd.

Small electric light plants suitable for country houses, farms, churches, &c., are a feature of the exhibit of this company. They comprise a 1-kW and a ½-kW "Lister-Light" fully automatic plant. An interesting exhibit is a 250-watt "Little-Lister-Light" plant (fig. 26). This is particularly suitable for bungalows and is driven by a unique ½-h.p. petrol engine. It is supplied with battery and battery stand. The display also includes a range of petrol engines embodying the

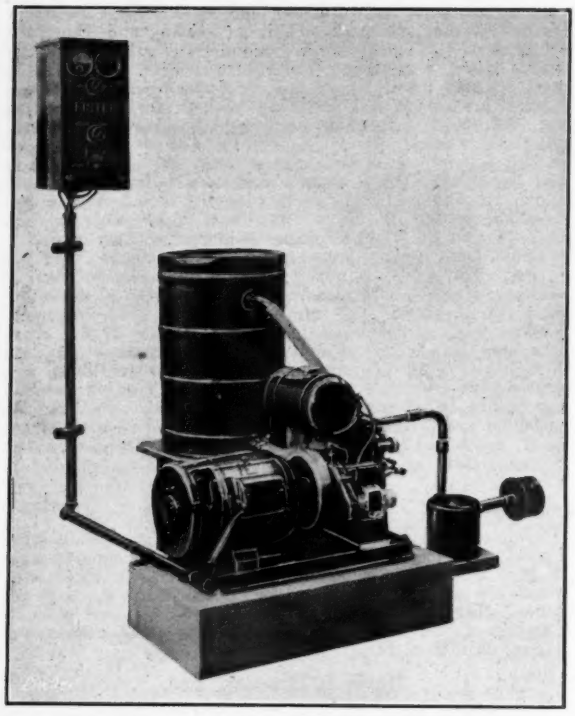

Fig. 26.—The "Little-Lister-Light" Plant.

"Ricardo" patent detachable combustion head which cuts down fuel consumption and increases horse-power. These range from 1½ to 20 h.p. and have been adopted by many industrial machinery manufacturers. Other exhibits are pumps for a variety of purposes which can be either belt, electrically, or engine driven, and auto trucks.

Pritchett & Gold & E.P.S. Co., Ltd.

The exhibit of this company consists of batteries for all purposes, including central stations, country house lighting, train lighting, &c. The closed top cell which was first introduced last year is again a prominent feature of the exhibit. A range of both high and low-tension batteries for wireless purposes are also on view.

Fescol, Ltd.

This company is showing a representative collection of articles in use by various metal users throughout the country, treated by its special process of electro-chemical deposition. The coatings shown comprise samples of deposits in nickel, chromium, cadmium, copper, and lead, and illustrate the application of the process for salvage and for initial protection against erosion and corrosion.

There are also exhibited samples submitted to the National Physical Laboratory for test purposes, with certificates showing the adhesion obtained in depositing metals by means of the "Fescol" process.

Blackstone & Co., Ltd.

This company, which is associated with Agricultural and General Engineers, Ltd., is exhibiting its oil, petrol, and paraffin engines, lighting sets and "unchokeable" pumps. Five slow-running horizontal "spring injection" engines, from 14 b.h.p. single-cylinder up to 130 b.h.p. twin, are shown. This twin-cylinder engine and a single-cylinder engine of 55 b.h.p. are shown working, together with a 76 b.h.p. twin-cylinder "spring injection" engine direct-coupled to a dynamo and generating electricity for the stand. All these engines are fitted with the Blackstone patented "spring injection" device, an important feature of which is that it functions correctly irrespective of the engine speed, and thus enables the engine to start instantly from cold on crude oil. It causes the complete combustion of the fuel, and gives smooth running without any severe shocks, and therefore without excessive wear. Two small self-contained totally-enclosed "spring injection" oil engines, of 5 and 8 b.h.p., are also shown. This type of engine forms a handy and compact unit for contractor's or farm use. Examples of the Blackstone "no trouble" petrol and petrol-paraffin engines are displayed, including a petrol engine of 2½ b.h.p. with hopper cooling tank; a 3½-b.h.p. petrol-paraffin engine on skids, and one of 6 b.h.p. on a concrete base. An exhibit of interest to owners of country houses is a 1½-kW petrol-electric lighting set, complete with batteries.

Highfield Electrical Co., Ltd.

This company has specialised in the development of dynamometers for the testing of internal-combustion engines, gear boxes, chassis, back axles, &c., and has a range of dynamometers to deal with engine powers up to 1,000 b.h.p. The dynamometer equipment may be divided roughly into two classes, *viz.*, production type and research type, and typical examples are shown. In the production type, the entire power developed by the engine is arranged to be pumped back in the form of electrical power to the works mains, and the saving thus gained ensures that in a very short time the dynamometers will liquidate their own capital cost. The horse-power absorbed in friction and that developed by the engine on test at any speed within the range can be ascertained at a glance from direct reading instruments, and running-in and testing are consecutive operations carried out at one setting without the necessity of changing over from motor to dynamometer. In the research type the measurement of power is by the torque reaction method, the dynamometer being in the form of a heavy cast-iron bedplate on which are mounted cast-iron pedestals housing large journal ballraces in which the field magnet system of the dynamo is free to rock or swing. The armature spindle passes through bearings provided in the field magnet assembly, and situated inside the bedplate journals, one end of the spindle being extended to take couplings for connecting up the apparatus to the crankshaft of the engine which is to be tested. The company is exhibiting a dynamometer incorporating a single dynamo which is the general form of set for testing comparatively low-powered engines, but it also manufactures apparatus in which a compound form of two dynamos in tandem is employed, arranged by patented means, so that they can be connected in either series or parallel in order to give the widest possible range of speed and loading. Between the two dynamometers exhibited a specimen torsion dynamometer is mounted. This is an arrangement whereby the twisting properties of a shaft which is under power are employed as a means for measuring the value of horse-power transmitted. The company also shows

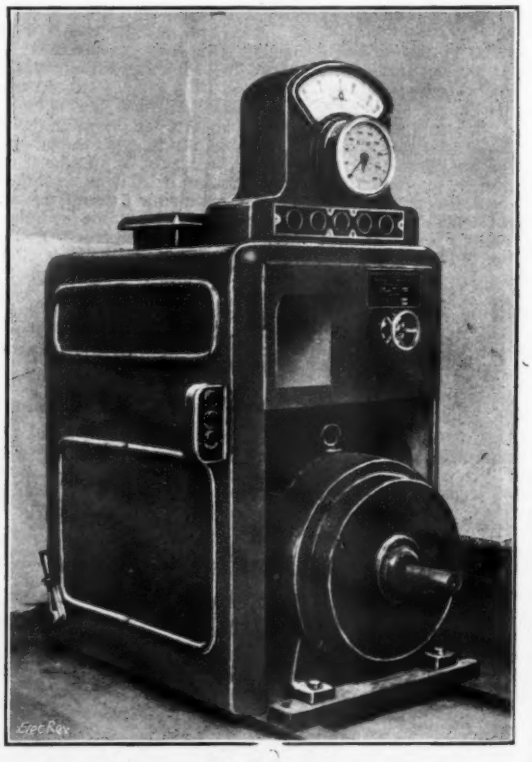

Fig. 27.—A "Highfield" Dynamometer.

a standard electric drill modified to include a switching device of patented design to disconnect the electricity supply from the drill motor in the event of excess torque such as occurs, for instance, when breaking through a hole in a thin metal plate. Another exhibit is a traffic controlling apparatus, which is unique, inasmuch as it is a departure from the three-lamp indication ones at present in use, it having only one point of illumination and presenting one lense only to the traffic.

Edison Swan Electric Co., Ltd.

The exhibits of this company are varied, and include iron-clad switches and fuses, standard switches, sockets and plugs, and bakelite switches. An extensive range of tungar rectifiers are also shown, and there are samples of mining and other cables, and the company's earthed and unearthed wiring systems. The wireless section of the exhibit includes a range of accumulators, dry cells and high-tension batteries, four types of transmitting valves, and all-electric and battery-operated receivers, together with a range of moving coil and other types of loud-speakers. The B.T.H. electric gramophone motor and pick-up and tone arm, and battery eliminators and transformers for various purposes also are exhibited. An

Fig. 28.—An " All-Electric " Radio Receiver.

" all-electric " receiver is shown in fig. 28. The domestic section includes metal, " Raymond " reflector, dome, imitation coal and bowl fires, electric irons, boiling rings and kettles. A representative collection of various commercial, industrial and other lighting fittings appear, either as exhibits or for illuminating the stand, and a range of " Ediswan " lamps, including the " Fullolite " and pearl, are exhibited. Other exhibits are a selection of " Sangamo-Ediswan " meters and the " Thor " Juvenator.

Ever-Ready Company (Great Britain), Ltd.

This company is exhibiting at both Birmingham and London. Upon the stand at Birmingham is shown a complete range of electric lamps supplemented by a few standard lines of the company's wireless batteries.

S. G. Brown, Ltd.

The two principal exhibits of this company are the Brown " Electro-Megaphone " and the " Electrogram." The " Electro-Megaphone " is designed chiefly for use aboard ship, the amplification obtained being some three times the normal voice. It is water-tight and the instruments are protected against all climatic conditions. Only cast metal boxes of non-corrosive and non-magnetic material are used. Great volume and purity of speech is obtained without the use of valves, and, as many as six receivers can be operated from one transmitter without loss of volume, or any increase in current consumption. Extraneous noises are eliminated by a patent differential " anti-howling " microphone, and speech can be transmitted over ten miles of line without appreciable loss of volume. A new type of aircraft megaphone has been designed incorporating many novel features to meet the requirements of aircraft of all types. The instrument enables the pilot to communicate with other occupants of the aircraft under all conditions, and it contains a switch enabling the pilot to receive wireless, and at the same time communicate with the wireless operator.

The Brown " Electrogram " is an electrically-operated gramophone giving a volume sufficient for restaurants, kinemas, dance halls, &c. It has two turntables which are electrically-driven from the mains and the current is automatically switched off when a record is finished. A " fade over " and a volume control are provided. The pick-up and tone-arm are of special design and so balanced as to reduce wear on records to a minimum. Examples of the company's loud-speakers are also exhibited.

Ringsdorff Carbons (England), Ltd.

An interesting exhibit on the stand of this company is the " R.B." spring steel flexible connection for carbon brushes. This is made of heavy gauge sheet steel and has no rivets, screws or soldered joints. It provides the maximum area of contact surface and there is no loss due to contact resistance and no flow of current to the brush guide. It also grips the flexibles on to the brush with the maximum of pressure. Other exhibits include carbon brushes, rings, plates and rods, contacts and disks.

E. Elliott.

This firm is represented mainly as manufacturers of bakelite electrical parts for the trade. As the bulk of the company's work is done in moulding for manufacturers' articles of their own design, it is not exhibiting articles to sell direct to contractors. Fancy goods made from " Birmite " are also shown.

Drayton Regulator and Instrument Co., Ltd.

On this stand there appears a range of switches and contact devices operated by temperature, humidity, pressure, and level impulses. A number of new patterns have been standardised over the last twelve months and are exhibited for the first time. A notable exhibit is the " H.C." humidity contactor, which operates relay switches on valves through a three-wire circuit. The contact arm is actuated by the deviation from a set wet bulb depression. The " H.C." contactor can be applied to the control of humidity in automatic sub-stations, work rooms, stores, and air conditioning generally. The " R.C." temperature contactor operates in the same way, the contact arm being actuated by a bi-metal thermostatic coil.

Taylor & Challen, Ltd.

The exhibits of this company include a toggle drawing press with an extension to the backshaft suitable for direct electric drive when required. Other smaller drawing presses are shown together with some examples of notching presses. Some of the exhibits are shown in operation.

Clear-Hooters, Ltd.

Upon this stand is displayed a selection of " Clarion " high-frequency electric horns for both cars and motor-cycles.

G. D. Peters & Co., Ltd.

This company is again exhibiting its " Wilson " plastic arc welding plant and three different types of plant are shown, *viz.*, a single-operator portable motor-generator set, a single-operator portable petrol engine-driven set, and a two-operator stationary motor-generator set. All three types of plant are fitted with the " Wilson " K-5 type automatic current control panel by means of which the current can be regulated so as to be steady and uniform, the variation not being greater than 5 per cent. This has the effect of maintaining the heat in the weld both local and constant, and, in addition to all usual welds in steel, it permits the welding of large iron castings to be undertaken without preheating. This is an advantage since heavy machines can be repaired without the need of dismanting. Another important feature of the " Wilson " plant is the low voltage of 18 at the arc which is employed. This obviates the necessity of using expensive flux or slag-covered electrodes and gives a two-fold economy, since the cost of " colour-tipt " welding metals is materially less than that of the slag-covered variety, and the costly process of chipping after the weld is made is entirely eliminated. The slight oxidisation which occurs with " colour-tipt " rods is easily removed with a wire brush.

The single arc portable motor-generator set (fig. 29) consists of a suitable motor direct-coupled to an open bracket type welding generator having a capacity of 150 A at 37½-45 V, a shunt-field regulator being used to control the voltage regulation. These are mounted together with a K-5 automatic current control panel, motor starter and shunt-field regulator on a substantial truck made up of steel sections. This plant may be seen in operation.

The single arc portable petrol engine-driven set is substantially similar to the plant mentioned above, but is driven by

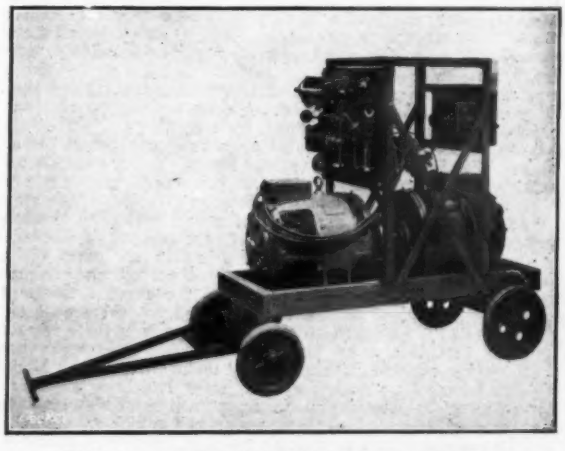

Fig. 29.—A Portable Motor-Generator Set.

a petrol engine instead of an electric motor. This is a four-cylinder engine and embodies a sensitive governor of special design.

The two-operator stationary welding plant consists of a motor direct-coupled to a level compounded generator having a capacity of 300 A at 37½-45 V, the variation in voltage being controlled by shunt-field regulation. This motor-generator set complete with motor starter and two K-5 automatic current panels is mounted on a baseplate. All plants are supplied with complete operator's equipment. A large quantity of " colour-tipt " welding metals are on view, there being a number of grades available for various classes of work. " Graphol," a rust solvent and lubricant, is also shown.

Hailwood & Ackroyd, Ltd.

Glassware of many descriptions forms a large part of this company's exhibit, among the articles shown being numerous types of electric lighting shades and fittings. This glassware is sold under the names "Hailware" and "Hailglassware" and the large range includes wall-brackets, table lamps, pendants, lanterns, ceiling fittings, &c. The company also supplies the metalwork for these fittings. In the exhibit many examples of modern lighting units are shown.

Cambridge Instrument Co., Ltd.

This company is exhibiting a representative collection of instruments for engineering and industrial purposes, including electrical CO_2 indicators and recorders, apparatus for recording the percentage of dissolved oxygen for boiler feed water,

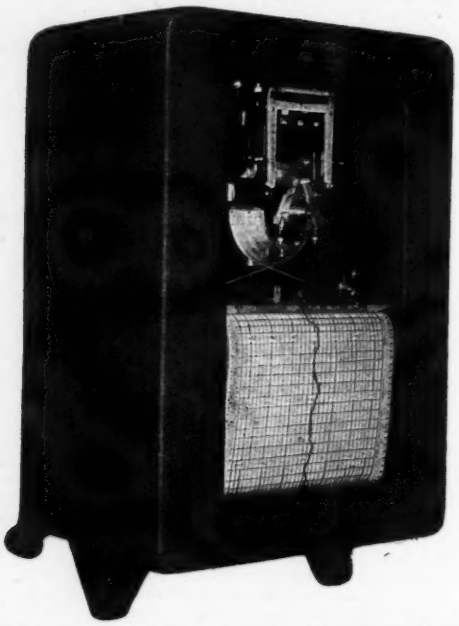

Fig. 30.—A "Cambridge" Recording Potentiometer.

draught and pressure gauges, temperature measuring instruments, and other instruments for engineering and electrical measurements. In addition "Cambridge" instruments can be seen in actual operation on other stands.

In the company's exhibit there are examples of electrical instruments for gas analysis, including a 4-point combined indicating and recording CO_2 outfit, and a 2-point CO_2 and CO indicator. In the latest form of combined CO_2 meter and aspirator the meter is now combined together with a water bubbler and aspirator to form a complete all-metal metering unit, which gives accurate readings in widely varying boiler house conditions. A portable instrument for giving readings of CO_2 percentage and temperature at various positions in the flues is also shown. A dissolved oxygen recorder, a robust boiler house instrument, for recording the percentage of oxygen in boiler feed water on a calibrated chart, is on view. This is produced in various forms. Other exhibits are draught and pressure gauges, a combined pressure and temperature recorder, glass thermometers, dial thermometers (vapour pressure type) and indicating and recording thermometers (mercury-in-steel type). With the company's electrical distance thermometers the temperature in all parts of a works or building can be accurately observed on a single instrument, which can be placed in the most convenient position. A 12-point indicator is exhibited. A thermo-electric pyrometer with a standard thread recorder giving three records on one chart is also on view, the galvanometer mechanism being totally enclosed within a robust metal case, and a "Model B" recorder. The design of the latter has been simplified by limiting its application to temperatures which can be measured with base metal thermo-couples (up to 1,200 deg. C.), and by making it only as a single point instrument. Examples of the "Cambridge" stator and rotor temperature outfits, are also included. The recording potentiometer illustrated in fig. 30 has been designed to give continuous, accurate records of small variations in electromotive force. It may be employed, for example, to record temperatures, voltages, currents, power and a.c. frequency, humidity, hydrogen ion concentration, the calorific value of gases, and various constituents in gas analysis. The potentiometer can also be used for the automatic control of these conditions, and may be arranged to operate alarm signals if the electromotive force being measured should vary from any predetermined value. The a.c. microammeters shown incorporate Westinghouse metal rectifiers. The construction of these instruments enables the sensitive moving coil galvanometer to be adapted for the measurement of alternating currents down to a few microamperes. At the same time, the advantages of robustness and uniformity of the scale, associated with the moving coil instrument, are obtained. Another advantage is that the torque/weight ratio is smaller than for a moving iron instrument, with the result that the deflecting forces need only be small, and hence the power consumption is reduced to a minimum. Many other interesting instruments are exhibited.

Earle, Bourne & Co., Ltd.

On this stand is displayed a comprehensive range of the company's manufactures, including cold rolled brass of various alloys, and solid drawn brass and copper tubes for many purposes, light copper tubes, &c.

Bromford Tube Co., Ltd.

Exhibits of electrical interest on this stand are seamless steel lighting standards. These are made with fluted columns, both spiral and vertical, and special advantages are their high tensile strength, freedom from structural weaknesses such as blow holes and cracks, lightness in weight, &c. In addition to these, hot-finished weldless steel tubes of all classes, including tram and transmission poles, boiler tubes, &c., are on view.

Henry Hope & Sons, Ltd.

In addition to its standard steel windows and sashes, "Lok'd Bar" factory sash, examples of hardware, and wrought leadwork for modern buildings and for garden ornaments, this company is showing patent roof glazing, with electrically-controlled opening light.

Electrical Power Engineers' Association.

The Association has again taken a stand, which, as on previous occasions, will become a rendezvous for members and friends of the Association who are visiting the Fair. Visitors to the stand will be able to see exhibits of various electrical manufacturers of particular and special interest to electrical power engineers, together with a comprehensive selection of up-to-date literature from well-known publishers, pamphlets and leaflets illustrating the activities of the Association, and the work and progress of its latest development, the National Technical Groups.

Tungstalite, Ltd.

On this stand is exhibited all types of "Tungstalite" incandescent electric lamps. The types demonstrated include vacuum lamps in series varying from 10 to 200 watts, which are shown in clear, opal, and internally frosted glass. A special feature is the "Tungstalite" shock-resisting traction lamp, which is demonstrated in use on a shaking machine producing 2,000 "falls" an hour.

Davey, Paxman & Co., Ltd.

One of the chief features of this company's exhibit is a "4-VKE" vertical heavy fuel oil engine (fig. 31) with normal power of 265 h.p. at 333 r.p.m. and overload for one hour's duration of 305 h.p. This engine is of the enclosed forced lubrication type with exterior oil sump, and the design incor-

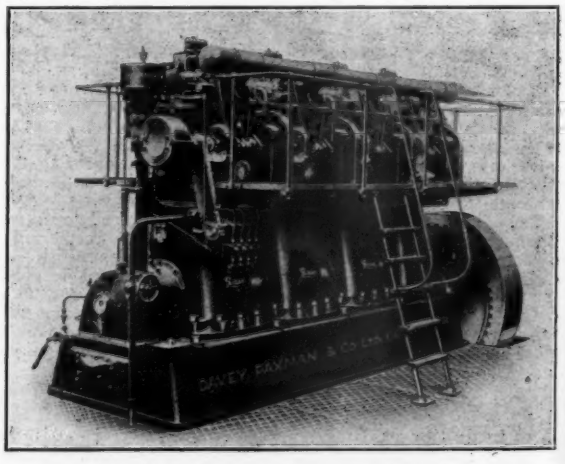

Fig. 31.—A Heavy Fuel Oil Engine.

porates the "spring injection" system of fuel injection (used by Messrs. Blackstone & Co., Ltd., on their horizontal engines) and the Paxman patent eccentrically-operated exhaust valve gear. The lubrication to all main working parts is under pressure, a special oil baffle being provided to promote economy. The cylinders are provided with detachable heads and separate liners which prevent any stress due to varying working temperatures, &c. Other parts exhibited include a complete section through one cylinder with cylinder frame, liner section, cylinder head, valve gear, and injection mechanism. Another interesting exhibit is a Paxman patent all-steel sectional hot water boiler.

The Future of the Australian Market.

The Views of Mr. R. W. Dalton, H.M. Senior Trade Commissioner.

THE Department of Overseas Trade has recently issued a report (Stationery Office, price 4s. 6d. net) on economic and trade conditions in Australia up to August last, written by Mr. R. W. Dalton, Senior Trade Commissioner in Australia. Although by reason of the overthrow of Mr. Bruce's Government and the introduction of higher import duties, which have occurred since the report was closed, Mr. Dalton's comments on the position of the Commonwealth lose some of their significance, there is in the 248 pages of his report very much information which will be of interest and value to those concerned with Australian trade.

For many months the Commonwealth has been very fully in the public eye in this country, owing to industrial disputes, political changes and, more recently, a declining tendency in the values of Australian securities. These causes are interdependent, and have been accompanied by a period of depression which, it is to be feared, has not yet reached its lowest level. Mr. Dalton attributes the depression partly to circumstances which are not likely to recur. Indeed, he describes the depression as only "so-called," and says that the reasons for it are to be found less in any radical change for the worse in production conditions than in unfavourable economic conditions supervening on a period of inflation. It is possible, however, that Mr. Dalton's guarded optimism may have been based on the hope that Mr. Bruce's party would have remained longer in power and that some practical effect would have been given to the recommendations of the various experts, both English and Australian, who last year advised Commonwealth interests to modify their policy of over-industrialisation and ultra-protectionism. Any such hope seems likely to be deferred almost indefinitely now that Mr. Scullin has declared his intentions in no uncertain manner to protect to the utmost every possible manufacturing industry, despite the warning of independent economic advisers and industrial experts. There are, however, a number of promising indications.

Retrospect and Prospect.

The depression, says Mr. Dalton, is consequent to a considerable extent on the results of stern measures taken to rectify basic conditions which produced the artificial prosperity of former years, and on the deflation which was bound to follow. Statistics show very clearly that money is available in ample amounts for legitimate trading and investment uses. Proof of this lies in the over-subscription of Government and public authority loans for large amounts. In addition, important producing interests are taking very careful stock of the situation and introducing methods calculated to bring about more stable conditions.

At the same time it is admitted that it would be unwise to exaggerate the importance of the setback which has been experienced. Australia, largely owing to abnormally high world prices for its staple products, already referred to, has been enjoying for some time a period of considerable prosperity, and, like all countries in similar condition, is finding that there is always a reaction.

At this point, and before going further into the Trade Commissioner's report, it may be recalled that a reply to the critics of the financial policy of the Commonwealth was recently made by Mr. Fenton, the Australian Minister for Trade and Customs. He stated that the Commonwealth Government was fully alive to the situation, and would so order its acts as to ensure a return to normal financial and economic conditions as soon as possible. In estimating the private and public wealth of the country at between £3,500,000,000 and £4,000,000,000, he alluded to the great assets publicly owned in the form of railways, tramways, waterworks, electricity works, Post Office, telephones, wireless, and many other services. He described the resources and potential wealth of the country as illimitable, and said that they were on the eve of a great gold-mining revival. In 1927-28 Australia bought British goods to the extent of £10 4s. a head. On the subject of the tariff, he proceeded:—I have learned that there is considerable uneasiness as to the probable effects of the new Australian tariff in regard to British trade. The margin of preference has been maintained, and it still is the policy of the country to give preference to British next to our own manufactures. On the other hand, we are giving employment to many more of our own people. In fact, without the tariff we could not hold our population. Since I have been in London I have been interviewed by big business men who are planning for large increases in buildings and plant, as well as introducing new processes, and my last information from Australia points to a considerable revival."

Reverting to the Trade Commissioner's report, it is stated that because of the process of deflation a contraction of imports is foreseen for the time being at least and that no recovery to anything like the level of 1926-27 is to be expected in the near future. But the introduction of policies tending towards deflation and towards the establishment of a sounder economic condition will undoubtedly have the effect of making more stable and more reliable a market which is of vast importance to the exporting industries of Great Britain.

Scope for British Trade.

In Mr. Dalton's opinion, in spite of the existing economic limitation of imports, there is ample scope for the improvement of trade from Great Britain to Australia. In the report a special analysis of the import trade of Australia has been made. From this analysis, details of which cannot be given in the space available here, it is found that the total value of the import trade of Australia, which may be considered to be trade in goods which the United Kingdom could supply, amounts to just over £108,000,000. This trade has again been divided into two parts, one consisting of classes of goods in which British trade is pre-eminent, and the other consisting of classes of goods in which competition with Great Britain is severe. The total of the former is roughly £53,000,000, and of the latter £55,000,000. Of the former (that is, trade in which Great Britain is pre-eminent), the proportion of total imports supplied by the United Kingdom is no less than 85 per cent. On the other hand, of the trade in which there is a severe competition, namely, £55,000,000, the United Kingdom secures only about 30 per cent.

The deduction the Trade Commissioner draws from his detailed analysis is that while the limitation of British exports to Australia is due to some extent to the protective tariff, there is proof of the ample scope for improvement inasmuch as she has only been able to secure 30 per cent. of an important portion of the trade, when her share of the total competitive trade of Australia is over 57 per cent. and her share of one-half of it is over 85 per cent. If foreign firms can succeed to such an extent in these classes of goods, it is obvious that it is not the tariff alone which is limiting Great Britain's trade with Australia, and that, as the result of closer investigation of conditions and the exercise of greater effort, there is still room for considerable addition to British exports to this market.

The line of approach is said to be in two directions. First, it must be realised that Australia is determined to continue to protect her local and secondary industries. If, therefore, Great Britain's trade is to be maintained, British manufacturers must realise that they must be prepared to look for their trade increasingly amongst other more advanced lines of production than hitherto they have been considering. Secondly, they must realise that these new and specialised lines often demand different selling methods from those which have been commonly adopted by British manufacturers in the past.

Competition in Special Lines.

As illustrating the point which it has been desired to make regarding the supply of "specialised lines" to Australia by foreign countries, it may be of interest to give some examples of trades in which there would appear to be no real reason why Great Britain should not apply herself to change the existing position.

The following are some of these examples with a note in parenthesis of Great Britain's percentage share of the total imports in each line in 1927-28:—Adding and computing machines (4½ per cent.); cash registers (£82 out of £75,048); typewriters (9 per cent., trade worth £200,000); cream separators (8 per cent.); tractors (5 per cent., trade worth over £1,000,000); kinematograph films (less than 7 per cent.); watches and clocks (less than 8 per cent.); pianos (less than 7 per cent.); vacuum cleaners (9 per cent.). These are only a few cases chosen at random. A large number of other cases in which the percentage is higher but still very unsatisfactory could be given: for instance, motor cars and parts (17½ per cent. of trade worth over £8,000,000); agricultural machinery (14 per cent.); knitting machinery (22 per cent.); lamps and lampware (25 per cent.); and electric fans (19 per cent.). In addition to these, which are among the most glaring of the low percentages, there is a large number of lines in which trade is very considerable in which the British share might be very materially increased, as, for instance, in the rapidly growing wireless trade (referred to in detail later) in which Britain's share is only about 33 per cent., as compared with the share of nearly 50 per cent. secured by the United States. Numerous cases of this kind could be quoted, but they are readily noticeable in the details given later class by class. The United States is, of course, the competitor most frequently to be found securing the trade which Britain has not up to the present been able to obtain. In the metal manufactures and machinery sections (the trade in which in

1927-28 was worth £42,801,885) the United States secured trade to a value of £15,235,464 as compared with £23,580,677 secured by the United Kingdom, or nearly 80 per cent. of that trade of the class which was not in the hands of Great Britain. Incidentally, too, the United States trade in these two sections alone accounts for about 43 per cent. of her total trade with Australia, and about 65 per cent. of her trade in the competitive section (*i.e.*, excluding oils, timbers, and the like).

In view of the significance of the recovery of German trade the report gives a number of instances of important increases as between the years 1923-24 and 1927-28. For example, imports of electrical machinery and appliances from Germany increased during the period named from £43,886 to £174,992, while those of scientific instruments rose from £53,426 to £132,458. Such increases illustrate the point which Mr. Dalton emphasises in his report that it is entirely wrong to suppose, as many manufacturers in the United Kingdom seem to suppose, that the Commonwealth is at least a stationary if not a declining market from the point of view of import trade. In these circumstances it will be of value to reproduce the Trade Commissioner's analysis of the import statistics relating to machinery.

(To be concluded.)

American-German Co-operation.

Threat of Intensified Competition with British Manufacturers.

THE rumours circulated in the German newspapers in recent months concerning the intention of the Siemens and Halske Company to raise a large loan culminated at the beginning of February in the issue of an official notice by the company that the Deutsche Bank and the Disconto Gesellschaft had arranged for the raising of a loan by the New York firm of Dillon, Read & Co. According to the notice, the German share of the loan is only for the amount of 10,000,000 marks and subscriptions are now being invited up to March 3rd, at the price of 175 per cent., while the American share is of the nominal amount of $14,000,000 and was offered (it is said to have already been subscribed in full) at the price of 233 per cent., realising a gross total of over $32,000,000.

The American loan is in the form of "participating debentures" and is practically a perpetual loan, as the date of maturity is 2930, or a thousand years hence. The debentures bear interest at the same rate as the ordinary shares of the German company, but are guaranteed a minimum rate of 6 per cent. After 75 years, down to the maturity of the loan, the "creditors," as the debenture holders are termed in the official notice, have the right to require repayment at the nominal value. The Siemens company, after 1942, can redeem the debentures at a price corresponding to the average quotation on the New York Stock Exchange in the six calendar months preceding the notice, subject to a minimum representing the price of issue plus a premium which diminishes annually and ceases in 1960. In the case of increases in capital the debenture holders are to be granted the same rights of subscription to new and similar debentures, &c., as to those now issued. The Deutsche Kredit Versicherung, A.G., of Berlin, is to act as trustee for the American loan. The new capital is stated to be intended for strengthening the working funds of the Siemens company (including, of course, the Siemens-Schuckert Works) and for the solution of numerous financing problems which the company expects in the near future.

It appears from the details published in the German newspapers that the loan negotiations between the German banks mentioned and the New York firm had been proceeding for some months. Just before the conclusion of the negotiations the Siemens company stated that it had received from the American banking firm an inquiry as to whether it would be agreeable to it if a considerable block of the new debentures were taken up by the General Electric Company, of New York. The Siemens company replied that it welcomed this opportunity of assuming friendly relations with a great and world-respected undertaking, and that the pleasant and tried connections which had existed for years with friendly associated firms in Germany and abroad would not be affected thereby. It was expected that the new contact would also have a favourable effect on the further development of the company's relations with other prominent firms, and the company saw therein an important step on the way to the solution of the great problems confronting the electrical industry.

Where Does the A.E.G. Stand?

A striking point in the above statement is the fact that the same American company recently took up shares for 30,000,000 marks in the German A.E.G. at the price of 200 per cent. What is likely to result from this dual participation with regard to the business relations between the two German companies and operations in the world's markets must be left for the future to decide.

It may be noted that under the participation of the American General Electric Co. in the A.E.G., American directors have been appointed to the board of the latter, but this is not the case with the Siemens company. The Siemens group aimed at borrowing foreign money without conceding any influence in the company. The American company did not negotiate directly with the Siemens group. After the New York banking firm had come to an understanding with the Siemens group—and the A.E.G. is also understood to have given its approval to the then contemplated action of the General Electric Company—an exchange of cables took place between the American General Electric and the Siemens company, in the course of which the Siemens company referred to the forming of friendly relations, as above mentioned, while the reservation made in respect of continuing friendly relations with other firms abroad is understood in the first place to apply to the Westinghouse Company, which is the only strong competitor of the General Electric Company in the United States.

The balance of the American loan, of the nominal amount of $4,000,000, was offered for subscription in New York on February 4th, and is said to have been at once subscribed in full, together with a small parcel in Amsterdam and England. Subscriptions to the German part of the loan, amounting to 10,000,000 marks, offered at the price of 175 per cent., have been invited up to March 3rd. The aggregate net proceeds resulting to the Siemens company from the combined loan is calculated at 152,000,000 marks (about £7,600,000).

Intensive Competition Foreshadowed.

At the first blush and before the exact amount of the participation of the General Electric Company in the transaction was known, it was assumed in German newspaper circles that the question merely concerned an investment, but when it turned out that the sum was as high as $10,000,000 (nominal) there was a change of opinion, and the impression was gained that in the background lay plans for an international understanding. The significance of the transaction would then be to bring about close co-operation in the heavier branches between the A.E.G. and the Siemens group, whose turnover is about the same; and later on also to extend that co-operation to the low-pressure department. The most probable development for the moment is thought to lie in the adoption of a system of co-operation in the export of heavy products. In this connection it is stated that the General Electric Company has hitherto only exported about 6 to 7 per cent. of its production, but the American market is now in a state of decline. To this is ascribed the forward movement being made by the company in France, Germany, and England. In overseas markets the General Electric Company is said to have found that foreign competitors were frequently able to offer at lower prices. The American home prices are materially higher than the German inland prices, and as a consequnce about 12 per cent. net is there earned as compared with, as is asserted, 2½ to 3 per cent. in the case of the German prices. But the German works are also eager for an international arrangement with regard to export prices because the prices they realise are deemed to be insufficient. It is considered that agreements, in the first place, would come into operation for special contracts, as, for instance, complete electricity works, &c. There seems to be no doubt that the General Electric Company expects that the Siemens company and the A.E.G. will come to an understanding both with regard to home prices and the export business. It is also held to be probable that the General Electric Company and the Westinghouse Company have for a long time past had limited agreements in operation.

It is stated that the only conclusion to be drawn from the events summarised above is that a determined attempt is to be made by both German and American interests, with their great financial backing, to dominate as large a portion of the foreign business as is possible, so that a distinct challenge is now to be made on a combined basis from those sources to English makers of heavy electrical engineering plant in their business in the world markets.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New Switch and Plug Plates.

We have received from Messrs. J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall, samples of their new flush-plate and centre piece for use in conjunction with a 5-A tumbler switch. Fig. 1 depicts the combination in the working position. The "Jacelite" plate itself is essentially a frame into which any of four centre pieces may be registered for vertical or horizontal assembly. Low erection costs and minimum stock requirements are two advantages claimed for this construction. The centre pieces provide for a 5-A switch, bell push, 2-pin socket and 3-pin socket. The particular

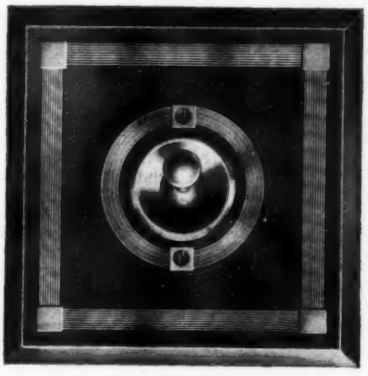

Fig. 1.—"Jacelite" Flush-plate and Centre Piece with 5-A Switch.

features of the flush units are: the interchangeability of all component parts; the non-rotational features of both the plate and centre piece, by virtue of projections in the outer periphery of the centre piece which fit into notches in the inner periphery of the plate; the substantial moulding and wide plate overlap; the chaste and uniform design. "Jacelite" moulding is a shockproof non-hygroscopic material which is claimed to be impervious to heat, oil and most acids. The finish is very pleasing.

New Floodlighting Reflectors.

To their already large range of commercial and industrial electric lighting fittings, PHILIPS LAMPS, LTD., Philips House, 145, Charing Cross Road, W.C.2, have added a series of floodlight reflectors, known by the trade name of "Philiflood." The series consists of four types, designated FL.A, FL.B, FL.C and FL.D, covering, it is claimed, every floodlighting

Fig. 2.—"Philiflood" Type FLC Reflector.

requirement. The reflectors are strongly made from vitreous-enamelled steel and cast-iron, types FL.A and FL.B being fitted with white-enamel reflectors, and types FL.C and FL.D with silvered reflectors, similar to "Philiray" shop-window reflectors. Type FL.B is of particular interest, as it is entirely unconventional in design. It is rectangular in shape, measuring 16 in.×9 in.×4¼ in., the light aperture being 7¼ in. in diameter. The advantages of this model are that it can be made to harmonise with the surrounding architecture and that it does not offend the eye during the daytime. The small dimensions are made possible by the use of a 1,000-watt tubular projector lamp. Fig. 2 shows the type FLC reflector.

Improved Barbers' Cistern.

We learn from INVENTUM ELECTRICAL APPLIANCES, 117, Victoria Street, S.W.1, that certain improvements have been embodied in the "Inventum" barbers' cistern, which we have already described. The improved type embodies a new mixing tap which, it is claimed, not only gives much closer regulation of water temperature from cold to very hot, but also simplifies the arrangement of feed pipes, &c.

A New Arc Welder.

The SCHOLEY CONSTRUCTION CO., LTD., 137, Victoria Street, Westminster, S.W.1, has for some years provided for tramway and railway welding work a form of convertor which consists of a double-wound armature and two commutators, and which operates from the overhead line at 600 volts, this being transformed down to a suitable welding voltage. An interesting development of this machine is the "Una" welder, fig. 3, which is a dynamotor specially made to provide direct current from a.c. mains. It is, however, more than a convertor in that mechanically it has one simple circuit, and yet electrically there are two distinct circuits. It operates as a synchronous motor with a resulting high power factor. It is claimed that a very short interval between the change

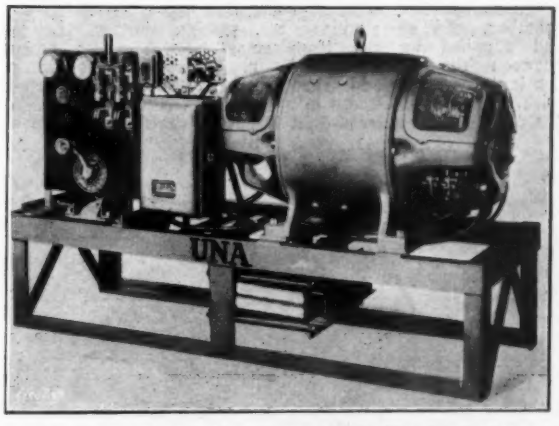

Fig. 3.—The "Una" Arc Welder; Stationary Model.

of resistance and change of voltage, caused by the variation in electrodes and the work, oil spots, rust, &c., are often the main causes of bad welding. In the "Una" machines this voltage change takes place at electrical speed, and in consequence there is secured an unusual degree of arc stability. In addition to the inherent stable arc, a suitable stabiliser is provided in the welding circuit, which still further improves its properties. The whole theory of the machine is to enable the welding operator to carry on his work with an unsual degree of arc smoothness, thus securing a steady production of work. In order to obtain a good quality of weld metal, a short constant arc is necessary. The welding characteristics of "Una" welders are such that this arc length is most easily maintained by the operator with less fatigue, even when welding vertical, overhead, or in a confined position. Freezing on breaking of the arc and other difficulties are reduced to a minimum, because the rush of current at the moment when the arc is established is fully controlled by the arc adjustor, and the machine is so designed that the full capacity of the machines may be obtained with either metallic or carbon electrodes. The machine possesses unique features in that there is incorporated in the welding circuit a low-range current control whereby it is possible to obtain a minimum of 25 amperes, which permits the welding of thin metal sheets down to 1/16 in. in thickness. The machine is supplied either as a stationary unit, fig. 3, or mounted on a suitable truck. The equipment is furnished with necessary control apparatus on a special panel containing a regulating switch and the usual meters.

The Jet-wave Rectifier.

An attempt to indicate the practicability of constructing mechanical rectifying devices of the kind devised by the author for large capacities.

By PROF. JUL. HARTMANN, Dr.Tech., M.I.E.E.

(Extracts from a paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.)

THE subject of this paper is a purely mechanical device which, in the course of the last 15 years, has been developed into a means of high-power rectification. Prototypes of the constituent parts of the apparatus have been described elsewhere.* The present paper shows how the rectifier can be designed on the basis of the prototypes, and especially on the result of investigations with regard to the theoretical relations between their qualities, which are stated and used in working out examples of typical designs. The general properties of the jet-wave rectifier are reviewed and anticipations with regard to its future development indicated, it being concluded that a new high-capacity rectifier, of a character quite distinct from that of the mercury-arc rectifier, but likely to be used for similar duties, has been brought into existence.

The jet-wave rectifier is not an arc or vapour rectifier. The mercury jet utilised, which is the moving member, forms a flexible commutating conductor. The jet J (fig. 1) is electrically separated from the commutation chamber and the motor-driven pump by means of the special nozzle R. The velocity of the jet is kept constant within a few tenths of one per cent., and its sine shape is produced by the interaction between a constant field F of from 5,000 to 7,500 gauss produced by electro-magnet coils, that are external to the chamber, and an auxiliary a.c. passing through the jet and supplied by the transformer V_A. The jet passes between the twin electrode E, with which it is in constant contact, and then makes contact alternately with the main electrodes E_1 and E_2; in passing from one to the other of the latter the jet is cut by the multiples knives W. For the rectification of a.c. the jet-wave is made to advance one-half of a wavelength ($\frac{1}{2}\lambda$) during one-half a period ($\frac{1}{2}$ T fig. 2) of the alternating voltage, which is achieved by utilising a current synchronous with the voltage to be rectified for producing the wave. Furthermore, the cutting of the jet wave by the knives W is effected at a definite point in the voltage wave, generally at the zero of the voltage, which is brought about by adjusting the distance between the field F and the electrodes E_1, E_2. The feature which makes the wave principle superior to the oscillatory and rotary principles of commutation is the absolutely stiff coupling between the voltage to be rectified and the motion which effects the rectification, *i.e.*, the motion of the "hitting point" of the wave at E_1 E_2.

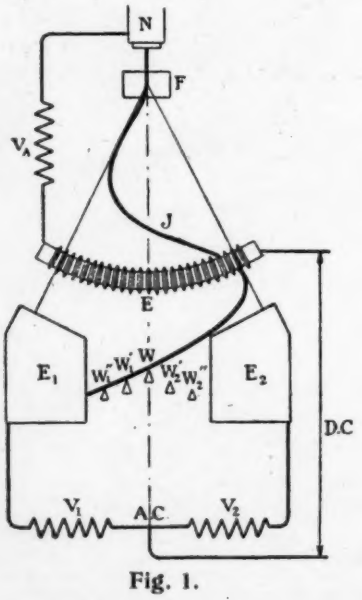

Fig. 1.

In fig. 2 E represents the voltage to be commutated, say, the voltage across the half phase V_1, in fig. 1. As the jet passes from electrode E_1 to E_2 metallic short-circuiting commences t_1 before the zero-point of the voltage. The overlapping interval is shown as τ_1 and the spark interval as τ_2. Now it was found that with a commutator with no stabilising device, t_1 (200-kW, 550-volt, rectifier) must be made as great as 10 or 12 per cent. of the half-period in order to ensure safe commutation, while with a stabilising device t_1 might be reduced to 3 per cent. Alternatively, commutation might be effected practically at the moment of zero voltage, which, of course, means a considerably improved commutator efficiency. At the same time it was found that the commutator was made practically independent of the ordinary fluctuations in frequency. The introduction of manifold cutting by means of the series of tungsten knives W constituted the stabilising device in the form of spark gaps in series. With 5 knives (fig. 1) the wave is cut simultaneously by 3 knives, and in the case of a 33.3-kW, 180-volt, commutator the stability is increased so much that t_1 (fig. 2) may be reduced to zero, or even made negative.

If the knife were arranged as shown by P (fig. 3*a*) the spark S would destroy it. However, tungsten knives of high melting point are used and arranged as shown by W (fig. 3*b*) so that the spark S almost always remains between the cut ends of the jet wave. It therefore only evaporates mercury, which is condensed again in other parts of the system. With an ordinary high-power commutator for, say, 30 kW, the height of the knife may be 5 mm. and the width of its base about 3 mm. Such a knife will withstand the normal spark power, which may amount to 1 or 1.5 kW, for practically any length of time, and so a "wearless" commutator for mechanical rectification has been brought into existence. Immediately the cutting of the jet wave is completed two sparks are undoubtedly formed at *a* and *b*. They, however, unite almost instantly into one single spark as indicated in fig. 3 (*b*). It has been proved that with regular operation of the knife the latter will handle overloads of 50 or 100 per cent. for considerable periods, and that it is not impaired by direct short-circuiting of the commutator. With normal commutation the knife must be adjusted to such a position relatively to the two sides of the main electrode that the sides are short-circuited for a short time (the "interval of metallic short-circuiting" or the "overlapping interval") during each commutation. Otherwise the circuit of the rectified current will be obviously broken and a greatly increased spark loss ensue, especially if the circuit contains self-inductance. The jet is enclosed in a chamber which is kept filled with hydrogen, because that gas is able to absorb the energy of the spark within the time available for the absorption to take place.

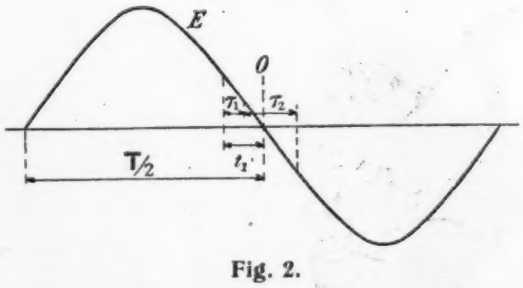

Fig. 2.

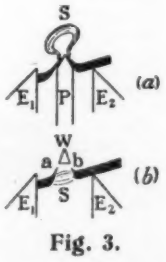

Fig. 3.

The voltage per jet is low, but rectification of multi phase voltages may be effected in several ways. That so far used is the 6-phase series method, which simply consists of three such commutators as that shown in fig. 1 connected to the three secondary phases of a 3-phase transformer, the three 2-phase rectifiers thus formed being connected in series. The resulting rectified voltage has the normal 6 ripples per period and the d.c. component is approximately 0.95 E_s (E_s being the maximum value of the phase voltage of the transformer secondary). In the case of a 200-kW, 550-volt, rectifier with

* ELEC. REV., September 23rd, 1927, p. 518.

six jets of 3.8 mm. diameter, and a velocity of 6 metres per second, the total amount of mercury pumped per second is 450 cm³, or 75 cm³ per jet per second, representing 1 kg. The efficiency of the pump aggregate has an important influence on the economy of the rectifier.

The jet-wave rectifier was developed in the municipal power station of Copenhagen, the H.C. Oersted works, and had a capacity of 200 kW at 550 volts, and the transformer was of 400-kVA, 6,300 volts, of Siemens-Schuckert make. Two complete plants were tested under ordinary working conditions. A 100-kW, 230-volt, plant was erected at the Northern Cable and Wire Works, Copenhagen, for running d.c. motors either alone or in parallel with the various d.c. sources of the works (a 200-kW rotary-convertor, a 500-kW motor-generator, and a 500-kW turbo-generator). It was kept under observation for nine months and behaved to the satisfaction of all concerned; commutation took place exactly at the zero point of the voltage.

The other plant, of 200-kW, 550 volt, is still in operation in the Nordsjællands Elektricitets-og Sporvejs-Aktieselskabs power station at Skovshoved, just outside Copenhagen, and is used to drive the electric street cars of that company. It has been kept under observation for several months and operates with complete satisfaction, handling without difficulty the disturbances which must be reckoned with in a substation for traction purposes. The sub-station was supplied with power from a 500-kV main covering a good deal of the southern part of Sweden and the eastern part of Denmark. At a certain juncture very interesting large-scale experiments were carried out on this main, the latter being several times short-circuited through arcs for from 1 to 3 seconds. The result was to throw practically all rotary-convertors out of operation, but the jet-wave rectifier continued to operate during the short-circuits, though with greatly reduced voltage, and continued working after the short-circuits had ceased and the normal voltage returned. The street cars were thus practically uninfluenced by the severe disturbances on the main, and it was probably not even noticed that experiments were being carried out.

Later, the effect on the rectifier of the direct short-circuiting of the street-car feeder proper, and thus of the d.c. circuit of the rectifier, was investigated. Three feeders, each with its maximum circuit-breaker, were operated in parallel by the rectifier, and one of the feeders was short-circuited. The effect on the rectifier was hardly perceptible, and the operation of the two parallel feeders was by no means affected. The short-circuit current per commutator was estimated as 1,000 amperes, *i.e.*, more than five times the normal load current. From these tests it may be concluded that the jet-wave rectifier has been developed into a perfectly reliable d.c. source.

The new rectifier has hitherto been produced for outputs up to 200 or 300 kW (with commutators) and for voltages of from 220 to 550 volts, but rectifiers of any size may be produced on the basis of the theoretical and experimental knowledge available. With regard to very large systems it may be anticipated that the efficiency will be slightly raised and that the amount of mercury required per kW will diminish. The efficiency of a 230-volt rectifier can be made nearly as high as that of a 550-volt plant with practically the same commutator. With a special main electrode the resistance of the commutator can be very considerably reduced and, as it is the resistance which is the predominant factor with low-voltage rectifiers, it may be concluded that economical rectifiers for 110-volt, or probably even 55-volt, direct current may be constructed. Obviously, if an economical 200-kW, 500-volt, rectifier is developed, a 600-kW, 1,500-volt, rectifier of at least the same efficiency is equally practicable, in that three commutators per phase can be used in series; but there is nothing to indicate that it will prove necessary to build a 1,500-volt rectifier from commutators of (1,500/9), *i.e.*, 167 volts. Commutators for much higher voltages can undoubtedly be produced, so that most likely a 1,500-volt rectifier can be made from three commutators for 500 volts each, and possibly a 3,000-volt rectifier from three commutators for 1,000 volts each. With such a rectifier the main-current loss will, with the same capacity commutator, be reduced to one-third of that in a 500-volt rectifier, *i.e.*, the efficiency will be raised by more than 1 per cent.

Rectifiers of 1,500 or 3,000 volts are, however, not the final goal. The author is convinced that the jet-wave commutator affords a practical means of the production of very high d.c. voltages, say, 100 kV or more, and ventures to predict that a 100-kV rectifier can be made from 100 very simple jet-wave commutators connected in series.

It is interesting to note that the jet-wave rectifier is capable of transforming d.c. into a.c. energy under certain conditions, which open up the possibility of producing a d.c. transformer by means of which the high d.c. voltage suitable for energy transmission may be stepped down to a value suitable for motor operation and electric illumination.

The jet-wave rectifier in its present form is, comparatively speaking, very simple, consisting of a few inexpensive parts adaptable to mass production. The most expensive material employed is, of course, the mercury. The amount necessary approximates at present to 0.5 kg per kW for the larger rectifiers. A further and very essential reduction may, however, be anticipated. It should be noted that absolutely no loss of mercury takes place, and that ordinary commercial mercury is perfectly suitable for the purpose. The substitution for mercury of some other metal, or alloy, of low melting point has been carefully considered, and could probably be done. While it is impossible to give exact figures for the cost of production at the present stage, it seems safe to say that in this respect the new rectifier will easily compete with other available means of a.c. rectification.

Discussion in London.

The author explained in English the contents of his paper with the aid of lantern slides and a short kinematograph film.

Mr. W. E. FRENCH, by means of a series of voltage and current characteristic curves, discussed his investigation of the process of commutation stabilisation as it took place in the author's rectifier, which was capable of being operated inverted.

Prof. W. M. THORNTON remarked that, though the author had been 15 years developing his invention, he should not be discouraged; the rotary convertor was invented 20 years ago, and it might be thought the simpler, but papers were, nevertheless, still being written on its theory. The regulation of the new rectifier seemed to be good, and its stability under short-circuit conditions appeared to be extraordinary. It should therefore be useful where short circuits had proved to be fatal to other types of convertor. The quantity of mercury required was not unduly large. Every new idea was an asset to the industry.

Mr. A. T. BARTLETT explained that he had had to investigate and report upon the jet-wave rectifier some time ago; at that time he was not greatly impressed, but the device had since been improved. It appeared to be particularly suitable for low-voltage work, as its losses were small. Its overload capacity was rather poor, for mercury-arc rectifiers were now being called upon to carry enormous overloads. With regard to the claim that the new rectifier could be made in large sizes, 300 kW was nothing to-day; could a 4,000-kW rectifier of the author's type be accommodated on a floor area of 9 square feet? What kind of a wave-form did it produce? The most important statement in the paper was that the jet rectifier was reversible.

Mr. S. A. STEVENS asked a number of questions.

Prof. E. W. MARCHANT inquired about the effect of the magnetostriction phenomenon. There might be a tendency under short-circuit conditions for the mercury jet to break up, and it might consequently be easier to clear faults on the outside system.

Prof. J. HARTMANN, in reply, could not agree that his device was specially suitable for low-voltage work. On the contrary, he claimed that, although it would go lower than an arc rectifier, aggregates of his commutators could be connected in series for high-voltage operation, and twin jets could be employed for the larger sizes. He was not aware of a 4,000-kW arc rectifier's existence, and had understood the largest made to be of the order of 1,600 kW. It was easy to carry overload, as he had not yet employed artificial cooling. There should be no difficulty in carrying a 50 per cent. overload for half an hour, while the maximum should be about five times the normal load for a short period.

It may be added that a jet-wave rectifier of 200 kW at 550 volts has been installed at Bradford, and is operating on the Corporation tramway system.

Railway Tunnel Doors.

Among the troubles of those responsible for the running of electric trains in Switzerland is that of keeping the tunnels clear of ice, particularly in the winter months. A case in point is the Charndaras tunnel, near St. Moritz, on the Bernina electric railway, into which much water percolates and, although provision is made for it to drain away, the temperature often falls considerably below freezing point. The result is that during the night not only does the collected water rapidly freeze, but hanging icicles are also formed, while the rails themselves become coated with ice, the trouble being accentuated by the fact that the entrance to the tunnel forms a sort of flue for an extremely cold blast of air. Hitherto it had been necessary to employ a gang of men to clear the tunnel of the ice which collected during the night before the morning train could pass through, but one of the engineers of the railway company, Herr E. Zimmerman, recently decided to provide the tunnel with doors, which are automatically closed and opened by the trains themselves by means of suitably-placed contacts which, on being closed, allow current to be passed to an electric motor installed in a small cabin at the side of the tunnel entrance. The door is made in halves, one portion opening inwardly and the other outwardly, which are moved by the electric motor through worm gearing a bevel pinion and sector, and suitable levers. To reduce the risk of accident, a series of signals is provided, a red light indicating that the tunnel doors are closed, a violet light that they are in process of opening, and a green light that they are open. Furthermore, even if under the stress of severe weather the doors are prevented from opening, it is stated that no great harm would be done if a train ran through them, as they consist merely of a wooden frame covered with sail cloth. The doors have considerably assisted in keeping the tunnel clear of ice, and it is proposed to adopt the idea in connection with other wet tunnels.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Motor Users and the Frequency Change.

The attention which is being paid in the technical Press to the various aspects of the frequency change (in so far as it affects the supply authority and the motor user) has been the means of exposing the extravagant claims that were made for dual-frequency motors for 25-50 cycles. It is almost incredible that these hybrids should ever have been seriously advocated for general application, but the fact remains that our early declaration against them found little support.

Mr. Percy Huggins's able article in your issue of February 14th definitely awards the first place for performance to the exchange method we have persistently advocated, but the unfavourable price comparison he makes against it calls strongly for qualification.

Two single-frequency motors (the second in part exchange) are procurable at a considerably lower capital cost than the dual-frequency motor. In addition, the facts that a considerable portion of the charge is deferred, and that there is no depreciation in the case of the first motor (25 cycles), no matter how many years it is in use, make the comparison of relative cost much more favourable to the exchange method than that given by Mr. Percy Huggins.

In the comparison of the time required to effect the change, the exchange method should have the time required for a thorough cleaning and lubricating of a motor deducted, as, of course, the new method obviates the need for this. Had these advantages been allowed for, the comparison would rightly have been overwhelmingly in favour of the exchange method.

Crompton Parkinson Limited,
T. H. WINDIBANK,
General Sales Manager.

London, W.C.2, *February 17th*, 1930.

Motor Convertors as Power Factor Correctors.

With reference to "A Mechanic's" inquiry in the ELECTRICAL REVIEW of February 7th, perhaps the following brief explanation will give him the information desired:—

For the present purpose a motor-convertor may be assumed to be a plain synchronous motor expending its energy partly in mechanical output and partly in correcting power factor.

Consider a d.c. motor of the same capacity, mechanically loaded to the same extent. If the field excitation be increased, the speed will be reduced, because the back e.m.f. remains constant.

In the case of a synchronous motor, as the speed is determined by the supply frequency and number of pairs of d.c. poles in the machine, the r.p.m. cannot be varied by altering the excitation; this results in wattless currents flowing in the stator circuit, which have the effect of keeping the field strength constant by adding to, or deducting from, the magnetising current of the stator windings.

In other words, if the field excitation is increased, the surplus field induces in the stator a leading wattless current drawn from the supply mains, which magnetically counter-balances the surplus field, and *vice versa* if the field excitation is reduced. This means that when the motor is over-excited it supplies a leading wattless current to the mains which compensates for the lagging wattless current of the installation to which the over-excited synchronous motor is connected.

H. D. Winchester.

Wakefield, *February 10th*, 1930.

Change of System or Frequency.

In reply to "Fairplay's" letter in the current issue of the ELECTRICAL REVIEW, the position with regard to system change-overs is as follows:—

Provided the consumer duly advises the supply authority of any extensions or additions to the original installation for which, in the first instance, application was made for a supply of electricity, it is the duty of the supply authority to substitute, at the change over, equivalent apparatus that will in every way give as good service to the consumer as the displaced apparatus.

It is not, however, incumbent upon the supply authority, except, perhaps, in very special circumstances, to provide spare parts.

It must be appreciated that a new installation is being substituted for an old one—perhaps a very old one. Therefore, once the new installation is in full running order, it is only reasonable to expect that the risk of breakdown will be proportionately less.

On the whole, a.c. motors and starting switches are simpler and more robust than those designed for d.c., and therefore the necessity for stocks of spares does not exist in the same degree.

Although the consumer is entitled to reasonable satisfaction, as regards his substituted apparatus, he is not entitled to be placed in clover.

Regarding the last paragraph of "Fairplay's" letter, he has raised a point that must be of considerable interest and importance to a great many. I mean those who, as a part of their business and in the interests of service, or who, of necessity, carry appreciable stocks of spares, which after the change of frequency will become obsolete and unsaleable.

One is tempted to remark that there has been ample warning; like the wise virgins, the holders of unstandard stocks should have been prepared and should be doing a little trimming to meet the occasion. There must, however, be many cases in which such foresight is not realisable in practice, and, as there appears to be no definite provision for reimbursing such losers, I think the situation is one that ought to be sympathetically dealt with by the C.E.B.

The supply authorities (who will be landed with large quantities of obsolete plant) will be compensated out of the change-over funds, and in their own interests will not, I think, be unreasonable on the question of spare parts for consumers, when such are essential.

Whether the manufacturers will be in a position to meet the contractor and service stockist in the same way is a matter of conjecture.

Perhaps it may be considered that the increase of business consequent upon the change over will be sufficient to mitigate the contractors' and stockists' losses. In any case, it seems that the matter requires careful consideration before it is too late.

H. D. Winchester.

Wakefield, *February 16th*, 1930.

Staff Welfare in the Wire and Cable Trades.

Several of the leading wire and cable manufacturers in this country have instituted superannuation schemes for the benefit of their staffs, but there are still perhaps a few important firms that have not yet adopted a system.

It is undoubtedly becoming agreed all round that welfare schemes, if properly devised and administered, are beneficial to the fortunes of a company. What is undoubtedly contrary to the interests of a company is for its staff to realise that, while the balance sheet shows substantial reserves in the form of general, special, and other reserves, not a penny is set aside for the benefit of the latter, who are parties to the earning of those reserves.

It is urged by the staff members of some of the wire and cable firms that they are engaged in one of the most fortunate trades in existence, a trade that seems to benefit at every turn from the expansion of electrical science and enterprise without being called upon to contribute a penny in return. The natural corollary to this argument is that, where there is such abundant prosperity for the shareholders, there should be some future provision made for the servants of the company who have long and faithfully served its best interests.

When it is realised, as it ought to be realised, that some of the sweated industries set aside each year a portion of their hard-earned profits for the benefit of their staffs, it would appear only reasonable to expect the more wealthy and fortunate firms in other industries to do likewise.

The wire and cable trades have enjoyed a substantial expansion of turnover during the past twelve months, and the end of this continued prosperity does not yet appear to be in sight. It is well, therefore, that this growth of prosperity should not outstep the measures required for the appropriate internal organisation of the industries concerned.

Progress.

February 14th, 1930.

Accumulator Charging.

May I suggest that the time is long overdue for some responsible body to lay down a definite scale of prices for accumulator charging.

Recently, I paid 1s. 3d. for a 2-V 60-Ah accumulator to be charged at an electricity supply company's works; this did not include topping up or even skilled attention, and, incidentally, the charging plant was of the most crude and inefficient description.

I afterwards inquired at a motor garage which undertook accumulator charging at a price of 10d., again exclusive; they informed me that it would be properly charged!

Considering that the electrical energy actually supplied was 120 W-hr., I think 10d. may justifiably be said to be exorbitant.

Could not a scale be drawn up to be used by all *bona-fide* charging stations whereby the charge for such an accumulator would be, say, 6d. or even less, including service? This would certainly encourage the use of the most efficient charging arrangements, and would discourage and eventually do away with those pseudo-electricians who have no right to dabble with electrical apparatus at all. This would be to the advantage of accumulator makers (whose products are so evilly used), electrical traders, and the general public.

E. A. Geoch.

Chichester, *February 14th*, 1930.

Aylesbury's Rural Area and Internal Isolation Switchgear.

The articles appearing in your last issue under the above headings are both extremely interesting, but I am particularly concerned with the latter, and for the following reasons:—It is headed "Internal Isolation Switchgear—An account of the Equipment evolved by Messrs. Switchgear and Cowans, Ltd." In the first place, this particular switchgear was evolved by Mr. G. E. Whitehead, of this city, in collaboration with myself. If we had not done so, it is reasonable to assume that switchgear such as that referred to would not have been installed either by the Municipal Corporation of Aylesbury or by the Central Board, and, knowing your desire at all times to be fair to all parties, I feel perfectly sure that you would wish that Mr. Whitehead—and even perhaps myself—might at any rate to some extent be referred to as the parties who evolved this particular type of switchgear, and more particularly the isolation part of it, to perhaps a greater extent than you have referred even to Messrs. Switchgear and Cowans, with whom Mr. Whitehead entered into a special arrangement for the manufacture of his switchgear, and to whom perhaps some amount of credit may be given with regard to the manufacture of it.

If by any chance I am incorrect in the claim which I have made as to this particular switchgear being of the "Whitehead" type, and manufactured under the patents taken out by him originally, no doubt Messrs. Switchgear & Cowans, Ltd., will take advantage of the opportunity of correcting me.

May I, in conclusion, just mention that I am still interested, not only in the design, but also in the development of this particular type of switchgear, and, obviously, I am anxious to avoid either Mr. Whitehead or myself being prejudiced as a result of this gear being claimed to have been evolved by any other parties.

Arthur Ellis.

Cardiff, *February 11th*, 1930.

We shall be obliged if "Arguer" will kindly send us his name and address.—EDS. ELEC. REV.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

21,064. "Telephone systems." Standard Telephones and Cables, Ltd., and T. S. Skillman. July 20th, 1928. (324,328.)

21,091. "Electric lampholders." J. R. Pullon. July 20th, 1928. (324,349.)

21,166. "Transformers of alternate currents in which the number of phases of the secondary winding is different from the number of phases of the primary winding." M. Urbinati. July 25th, 1927. (294,542.)

21,516. "Apparatus for the limitation of high short-circuit electric currents." K. Küppers July 25th, 1927. (294,549.)

23,924. "Sparking plugs." J. Y. Johnson (I. G. Farbenindustrie Akt. Ges.). August 20th, 1928. (324,316.)

24,055. "Electric power plants with asynchronous generators." Siemens-Schuckertwerke Akt. Ges. September 26th, 1927. (297,731.)

24,092. "Electric heaters." E. F. Ehrhardt (T. E. Murray). August 21st, 1928. (324,329.)

24,365. "Electric motor-starting apparatus." J. E. Allan. August 24th, 1928. (324,360.)

26,866. "Coin-freed automatic electricity meters, in which the connection between the switch handle and the switch mechanism is interrupted near the end of the movement which switches on the current." Allgemeine Elektricitäts Ges. September 26th, 1927. (297,735.)

26,958. "Acoustic resistance devices such as may be used, for example, in gramophones." Electrical Research Products, Inc. April 28th, 1928. (310,493.)

29,438. "Prepayment mechanisms for the control of the supply of electric energy." British Insulated Cables, Ltd., and L. B. Wilson. October 12th, 1928. (324,318.)

30,319. "Electrical measuring, protective, or control systems." Associated Electrical Industries, Ltd. October 20th, 1927. (299,062.)

30,366. "Electric lampholders." R. Pearson. October 20th, 1928. (324,354.)

30,494. "Time-control mechanisms for electric switches." G. Thornton-Norris, C. Gardner, and I. H. Abelson. October 22nd, 1928. (324,384.)

30,505. "Vacuum tubes." British Thomson-Houston Co., Ltd. November 11th, 1927. (300,265.)

30,666. "Electric switches for electrically-driven household machines." Electrolux, Ltd. (Inventia Patent-Verwertungs Ges.). October 23rd, 1928. (324,355.)

30,780. "Electrolytic deposition of chromium." W. G. Poetzsch. October 25th, 1927. (299,395.)

30,920. "Switching mechanisms such as used in automatic telephone systems." Standard Telephones and Cables, Ltd. (K. M. Sano). October 25th, 1928. (324,387.)

30,954. "Electric incandescent lamps." General Electric Co., Ltd., and J. P. Bowen. October 25th, 1928. (324,390.)

30,973. "Power systems." E. M. Johnson and Associated Electrical Industries, Ltd. October 25th, 1928. (Cognate application, 22,083/29.) (324,391.)

31,126. "Television and like systems and apparatus." J. L. Baird and Television, Ltd. October 26th, 1928. (324,399.)

31,250. "Petrol-electric road vehicles." H. R. Ricardo. October 27th, 1928. (324,410.)

31,521. "Secondary electric cells." L. A. Levy and Almeida Accumulators, Ltd. October 30th, 1928. (324,415.)

31,549. "Device for automatically switching-on the electric lamps of road vehicles." G. E. Tate and F. O. Monkhouse. October 30th, 1928. (324,417.)

31,606. "Electric light pendants." J. B. Meiklejohn and J. B. Meiklejohn, Ltd. October 31st, 1928. (324,421.)

32,394. "Automatic telephone systems." Relay Automatic Telephone Co., Ltd., and B. B. Johnson. November 6th, 1928. (324,430.)

32,444. "Electric switches." W. Outhwaite. November 7th, 1928. (324,431.)

32,521. "Electric induction furnaces." Siemens & Halske Akt. Ges. December 8th, 1927. (301,894.)

33,246. "Wireless-telegraphy receiving apparatus." P. W. C. Hollowell. November 13th, 1928. (324,445.)

33,447. "Electrical apparatus for operating railway switches automatically." Rangiertechnische Ges. January 21st, 1928. (304,586.)

33,476. "Protecting devices for alternating-current three-phase motors." P. Geny. November 15th, 1928. (324,448.)

33,852. "Manufacture of insulated plates of magnetic material for electrical purposes." Associated Electrical Industries, Ltd. November 19th, 1927. (300,911.)

34,030. "Bow trolley for electric vehicles and the like." English Electric Co., Ltd., and F. Morris. November 20th, 1928. (324,458.)

34,191. "Transformer tap-changing arrangements." General Electric Co., Ltd., and C. H. Nunn. November 21st, 1928 (324,460)

34,418. "Thermionic push-pull amplifiers." S. G. S. Dicker (Naamloose Vennuotschap Philips' Gloeilampenfabrieken). November 22nd, 1928. (324,464.)

35,911. "Rotary electromagnetic delay devices." A. Rio and L. Levy. December 30th, 1927. (303,151.)

36,122. "Electric induction heating installations." P. Viry. December 12th, 1927. (302,235.)

38,381. "Loud-speaker arrangement." Dr. S. Loewe. December 29th, 1927. (303,175.)

38,509. "Sound-reproducing or transmitting instruments." S. G. Brown. December 31st, 1928. (324,493.)

1929.

168. "Arrangement to reduce the internal capacity of electronic tubes." Soc. des Etablissements Ducretet. January 13th, 1928. (303,888.)

557. "Arrangement for treating liquids with ultra-violet rays." Patent-Treuhand-Ges. für Elektrische Glühlampen and Dr. K. Wiegand. January 7th, 1929. (324,503.)

1,317. "Electromagnetic sound reproducer." Brandes Ltd. June 12th, 1928. (313,484.)

1,809. "Manufacture of electric condensers." International General Electric Co., Inc. January 20th, 1928. (304,323.)

2,529. "Railway control systems." General Railway Signal Co. January 25th, 1928. (304,733.)

3,149. "Fastening of heating-rods in electric furnaces and the like." Siemens-Schuckertwerke Akt. Ges. February 4th, 1928. (305,470.)

3,830. "Electric accumulators." Chloride Electrical Storage Co., Ltd., and H. Dean. February 5th, 1929. (324,533.)

4,730. "Sound-producing apparatus." Submarine Signal Co. June 27th, 1928. (314,422.)

4,803. "Electrical transformer cooling tanks." Associated Electrical Industries, Ltd. February 14th, 1928. (306,039.)

5,075. "Directional wireless signalling." Brandes, Ltd. February 21st, 1928. (306,487.)

5,757. "Electric switches, wall plugs, ceiling roses, fuses, and the like." G. Marr. February 21st, 1929. (324,551.)

7,057. "Electric pick-up supports for gramophones and means for indicating the position of the needle in the record groove and to facilitate synchronous reproduction with picture projection." C. H. Verity. October 22nd, 1928. (Divided application on 30,476/28.) (324,411.)

7,878. "Transmission gearing for driving electric dynamos coupled to internal-combustion engines." Fiat Soc. Anon. December 12th, 1928. (324,564.)

7,947. "Lifts, hoists, and the like." Associated Electrical Industries, Ltd. March 15th, 1928. (307,892.)

8,525. "Radio-receiving systems." Marconi's Wireless Telegraph Co., Ltd. March 15th, 1928. (307,894.)

8,871. "Failure-indicator devices for the rear lamps of power vehicles." O. C. Michelsen. March 19th, 1929. (324,572.)

9,009. "Radio-transmitting apparatus." Kolster-Brandes, Ltd. March 20th, 1928. (308,270.)

9,569. "Telephone apparatus more particularly adapted for use in wireless loud-speakers." P. A. Macchioni. March 24th, 1928. (308,672.)

9,621. "Impedance-matching devices suitable for use in high-frequency transmission systems." Marconi's Wireless Telegraph Co., Ltd. March 23rd, 1928. (308,664.)

10,823. "X-ray installations." Naamloose Vennootschap Philips' Gloeilampenfabrieken. April 19th, 1928. (309,997.)

11,954. "Electric transformers." International General Electric Co., Inc. April 17th, 1928. (309,926.)

12,203. "Protective systems for alternating-current commutator motors." British Thomson-Houston Co., Ltd. April 20th, 1928. (310,048.)

12,204. "Dynamo-electric machines." International General Electric Co., Inc. April 23rd, 1928. (310,330.)

12,698. "Electrodeposition of metals." Imperial Chemical Industries, Ltd., and J. Hollins. April 24th, 1929. (324,589.)

13,876. "Adjustable electric lamp socket." National Carbon Co., Inc. May 22nd, 1928. (312,229.)

14,665. "Electric induction furnaces." E. F. Northrup. June 5th, 1928. (313,044.)

15,510. "Electric motor-speed regulation systems." Associated Electrical Industries, Ltd. May 19th, 1928. (312,086.)

16,811. "Electric incandescent lamps." British Thomson-Houston Co., Ltd. May 31st, 1928. (312,695.)

19,147. "Loud speakers." C. A. Gardner and A. C. Gardner. June 21st, 1929. (324,608.)

19,607. "Electric furnaces." Birmingham Electric Furnaces, Ltd., and A. G. Lobley. December 28th, 1928. (Divided application on 314,775.) (324,609.)

22,603. "Coils for use in radio-receiving and transmitting apparatus and for like purposes." H. W. Adey. November 3rd, 1928. (Divided application on 32,076/28.) (324,614.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 12th:—

Vigilus (lettering and design). No. 494,279. Class 6. Ignition machines and parts thereof for motor vehicles.—Thompson Manufacturing Co., Ltd., Water Lane Works, Richmond, Surrey.

Helia. No. 506,049. Class 13. Electrical suspended switches (ordinary).—F. C. Bint, trading as Bint & Co., 5, Dowgate Hill, Cannon Street, E.C.4.

Crayonne. No. 508,954. Class 50. Covers and bases for electric switches and bells, electric lighting fittings and plugs, &c., all made from compositions in which cellulose predominates.—A. W. Kania, 66, Aldersgate Street, E.C.1.

Growth of Industrial Heating in U.S.A.

It is estimated by the National Electric Light Association that the output in 1929 from United States public supply stations used for industrial heating approximated 6,000,000,000 kWh at an average rate of about 0.58d. per kWh. The data was derived from 14 companies which between them supply 15 per cent. of the total output of the country. Between 1924 and 1928 the kWh sold by these undertakings increased by 104 per cent. for heating as compared with 64 per cent. for lighting, 69 per cent. power and 13 per cent. traction. The total increase was 58 per cent.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Housing scheme (168), Torry site; city engineer.

ABERYSTWYTH.—Municipal pavilion (£29,000), for the T.C.; S. McLauchlan and S. B. Howard, architects, Royal Liver Buildings, Liverpool.

ALDERSHOT.—New schools at Manor Park and reconstruction of existing schools at West End, for the E.C. (£50,000).

ASHFORD.—School (800 places), for Kent E.C.; E. Salter Davies, director of education, Maidstone.

BANGOR (North Wales).—Housing scheme for T.C.; B. Price Davies, engineer and architect, Town Hall (deposit £3 3s.).

BARNSLEY.—School (640 places), for the borough E.C.; director of education.

BIRMINGHAM.—Baths at Kent Street, for the City Baths Committee (£75,000).

BLACKBURN.—Omnibus depôt. Public wash-house, adjoining Belper Street Baths (£9,000); borough engineer.

BLACKPOOL.—Church hall, for St. Mary's Church (£6,000); F. T. Waddington & Son, architects, 52, Abingdon Street.

BOLTON.—Development of new estates, for Lady Beaumont. Library, Breightmet. Municipal aerodrome, Four Lane Ends; W. Brown, borough engineer, Town Hall.

BRADFORD.—Eleven shops adjoining St. James Market. Extensions to Technical College (£11,000); city architect.

BURNLEY.—Housing scheme (102), Stoops estate; borough surveyor.

CANE HILL.—Nurses' home, mental hospital (£29,000); L.C.C. architect.

CASTLEFORD.—Factory, for J. Lumb & Co., Ltd.

CHARTHAM.—Nurses' home in hospital grounds; J. L. Seaton Dahl, architect, Radnor Chambers, Folkestone (returnable deposit of £2 2s.).

CHESHIRE.—Schools, for the E.C. (£910,231); director of education, Chester.

CLEETHORPES.—Extension, Lifeboat Hotel (£14,000); proprietor.

COULSDON.—Development of Oaklands estate; F. Betts.

COVENTRY.—Factory, Leicester Causeway, for the Godiva Hosiery Co., Ltd.; W. R. Simister, architect, 15, Park Road, Old Trafford, Manchester. Factory, Northfield Road; George Cave, architect, City Chambers, High Street.

DARTFORD.—Houses, Dartford Road (20), and Devonshire Avenue (16); W. J. Brise. Stores, for London Paper Mills Co., Ltd.

DEWSBURY.—Rehousing scheme (50), for the T.C.; borough surveyor.

DOUGLAS (I. of M.).—Flats, Bigwell Street; Mr. Teare, architect.

DUDLEY.—Extensions, Art Gallery; borough engineer.

DUNDEE.—Building with electric lighting work, for Corporation Public Health Department; George Baxter, city engineer.

DUNSTABLE.—Housing scheme (300), for the T.C.; borough surveyor. Extensions, printing works, for Waterlow and Sons, Ltd.; V. E. Goodman, manager.

EASTBOURNE.—Housing scheme, Roselands; borough engineer.

EAST COWES.—Extensions, Grange Road schools, with electrical and heating work, for Isle of Wight E.C.; director of education, Newport.

EPSOM.—Hotel, Chase estate, for Watney, Coombe Reid and Co., Ltd., brewers, Stag Brewery, S.W.

FOLKESTONE.—Church hall (£30,000), Morehall, for the Wesleyan trustees; Rev. H. P. Garland.

GLASGOW.—Houses (42); W. T. Aitkenhead, builder, 10, Ravenshall Road, Shawlands.

GURNARD.—Hotel, Woodvale estate, for W. B. Mew, Langton & Co., Ltd., brewers, Newport, Isle of Wight.

HALIFAX.—Public conveniences with electrical work; A. C. Tipple, borough engineer, Crossley Street. Tenders to Percy Saunders, town clerk, Town Hall, by March 3rd. (deposit £1 1s.).

IRISH FREE STATE (Rathmines, Co. Dublin).—Four blocks of houses at Mount Pleasant and Hollyfields, for the U.D.C. (£20,000).

LEEDS.—Senior Council schools, Osmondthorpe; Architect's Section, Education Offices, Calverley Street.

LEICESTER.—Houses (207), Humberstone; Sheriff & Co., builders, 444, Gipsy Lane.

LETCHWORTH.—Secondary school, for Herts E.C.; Barry Parker, architect, Norton Way (returnable deposit of £1 1s.).

LLAY.—Miners' Institute (£16,000); W. F. Humphreys, builder, Acrefair.

LOCHIE.—Masonic Hall (£5,000); James Lowe & Co., architects, 104, Commercial Street, Dundee.

LONDON (East Ham, E.).—Houses (57), Nelson Street and Market Street; C. Griffiths. Girls' secondary school, White House site, for the borough E.C.; Mr. Kendall, education architect. Concert hall, Central Park. Mental institution; borough engineer. Garage, Redcliffe Road; L.G.O.C.

(Peckham, S.E.).—Two central schools; L.C.C. Education Committee.

(Westminster, S.W.).—Erection of Section D of the County Hall (£661,500,; L.C.C. architect.

(Battersea, S.W.).—Reconstruction of fire station (£26,000); L.C.C. architect.

(Brixton, S.W.).—Dwellings, Loughborough estate (£73,606); R. J. Rowley, Ltd., Tottenham.

(Hammersmith, W.).—Dwellings, southern improvement area (£33,500); borough engineer.

LONDON COLNEY.—School, for Herts E.C.; county surveyor, Hatfield.

MOFFAT.—Public hall (£6,000); borough surveyor.

NELSON (Lancs.).—School, Edgend (£28,954), junior school (£20,000), and two nursery schools (£10,000), for the borough E.C.; director of education.

NORTHFLEET.—School, for Kent E.C.; E. Salter Davies, director of education, Maidstone.

OLDBURY.—Housing scheme (98), Albright Road, Bristnall Hall estate; surveyor to U.D.C.

OTLEY.—Hotel, Newall; J. Hey & Co.

PURFLEET.—Houses (90), for the U.D.C.; Pavitt, Ltd., builders, Aveley.

PURLEY.—Four shops and flats, High Street; J. P. Oldacre.

REDCAR.—Girls' secondary school, for North Riding E.C.; director of education, Northallerton.

ROMFORD.—Houses (64), Rush Green Road and Dagenham Road; P. H. Evans.

ROTHERHAM.—Works and machinery; Alloa Shipbreaking Co., Ltd., H.M. Dockyard, Rosyth.

SCARBOROUGH.—Extension of Town Hall (£28,000); H. W. Smith, borough engineer.

SITTINGBOURNE.—Extensions, Keycol Hill Hospital, for the Joint Hospital Board; Marshall Harvey, architect, 36, Station Street (returnable deposit of £2 2s.).

SOLIHULL.—Police court; Worcestershire county architect.

SOUTHAM.—School (600 places), for Warwickshire E.C.; director of education, Warwick.

SPALDING.—School for Holland E.C.; director of education, Boston.

STOCKTON-ON-TEES.—Houses (378), with lighting and heating work, for the T.C.; George P. Stainsby, architect; Blackett & Son, builders, Darlington.

STOKE-ON-TRENT.—Housing scheme (26 acres), Norton; city engineer.

STRETFORD.—Seven shops and houses, Moss Road; Suburban Building Co.

TILBURY.—Library, stores, &c. (£15,000), for the U.D.C.; surveyor.

TRURO.—Electric lighting installation, County Hall, for Cornwall C.C.; clerk.

TUNBRIDGE WELLS.—Cinema theatre, with shops, offices, and dance hall; L. N. Jackson, Kosmos Kinema, Calverley Road.

TWICKENHAM.—Erection of six shops with flats above, Whitton Road and Chudleigh Road; Brewer, Smith and Brewer, architects, 11, The Green, Richmond, Surrey.

WALLASEY.—New school and extensions, for the E.C. (£180,000).

WARRINGTON.—School (4 buildings) (1,488 places); Weight and Hamlyn, architects, Patten Chambers, Warrington (returnable deposit of £10 10s.).

WETHERBY.—Hotel, Great North Road, for W. G. Johnson, Bradford.

WHYTELEAFE (Surrey).—Four shops, Godstone Road; E. O'Sullivan, Ltd.

WOLVERHAMPTON.—Housing scheme (174), Rough Hills; Jos. Hickin & Sons, builders, Willenhall. Sewage purification works (£89,000), Barnhurst; W. A. Boswell, contractor.

WORCESTER.—Extension of nurses' home, Infirmary; Col. A. V. Rowe, architect. Extensions, General Infirmary, with operating block; H. Percy Adams, architect, 7, Knightsbridge, London, S.W.

WORTHING.—Hotel Majestic, with lighting and heating work; Sir Lindsay Parkinson & Co., Ltd., builders, London and Blackpool.

WYKEN.—Junior school, Wyken Grange estate; A. C. Bunch, architect, 27, Binswood Avenue, Leamington.